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Engineering
Maintenance
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IN THIS ISSUE
Cost Cutting Methods
IN MAY
Highway Crossing Practices

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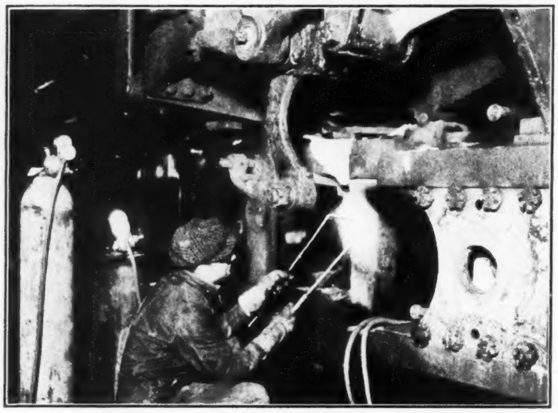

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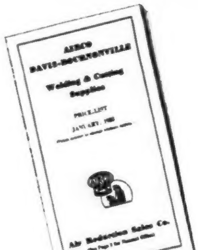

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Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

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CHICAGO, ILL.

Subject: BUYING FOR THE FUTURE

March 30, 1933.

Dear Reader:

Are maintenance of way officers short-sighted? While discussing railway purchasing practices with a prominent railway supply friend of mine a few days ago, he broke out with the statement—"Howson, railway officers are poor business men." When I remarked that he should be prepared to submit some very concrete evidence to back up such a sweeping statement, he continued: "They buy only for the present. They won't invest a dollar today to effect an economy tomorrow, large though that economy may be."

How about treated ties, I asked him. Untreated ties cost less. They last from six to eight years under average traffic and climatic conditions. Within that period treated ties will give no better service. Yet the railways have invested hundreds of millions of dollars in the treatment of ties, knowing that they will receive no return until after the termination of the normal life of the untreated tie. So it is with manganese track construction and many other materials which are all but standard on the railways today.

No, I do not believe that the railways are any less progressive or any less appreciative of potential economies than other industries of similar size. Rather, I am convinced that they are among the leaders in this respect - at least among those industries whose activities are so minutely supervised and whose earnings are so closely controlled. Has this been your observation?

Yours truly,

Elmer T. Howson

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Railway Engineering and Maintenance

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Railway Engineering and Maintenance

TAXES

A Menace to Railway Employees

THE story is told of a sightseer who was being shown through one of the government offices in Washington and who asked his guide how many people worked there, only to receive the reply, more truthful than tactful, "about half of them." If one were to charge the average maintenance of way employee with working for his railway only "about half of the time," he would resent this accusation. Yet, such a charge can be substantiated in a way, for of the money left to the railways after the payment of direct operating expenses, government took 46 per cent last year, or almost as much as was left for the owners as a return on their investment. In other words, the employees were, in reality, working for the tax collecting agencies rather than for the owners of the railways nearly half of the time during 1932.

An Unbearable Burden

This is a drain of such magnitude that it is undermining the ability of the railroads to provide employment. It has contributed very directly to the necessity for retrenchment measures which have severed three-quarters of a million employees from railway payrolls and imposed wage reductions and part-time employment on the remainder. Furthermore, while almost all other costs are coming down, taxes are showing little tendency in this direction except insofar as they are based on income or earnings. Railway employees have a very direct interest, therefore, in the rising tax burden, entirely aside from the taxes which they pay individually.

The magnitude of the tax burden is shown by the fact that in 1932 the various tax collectors, national, state and local, took 8.9 cents of every dollar received by the railways. This figure constitutes a new high record. It reflects the toll that is exacted from shippers and passengers alike. The rapid increase in the tax burden in the last few years is shown by the fact that as recently as 1914 taxes took only 4 cents of each dollar earned by the railways, while in 1926 the toll was only 6.1 cents. In the last six years, the increase has been almost 50 per cent.

Expressed in dollars, railway taxes increased from $29,806,000 in 1890 to a maximum of $402,698,000 in 1929, since which time they have declined, by reason of the drastic decline in railway earnings, to approximately $280,000,000 in 1932. Tracing the rise in railway taxation, tax accruals first exceeded $50,000,000 in 1902; they passed the $100,000,000 mark in 1911; six years later they exceeded $200,000,000. It took only five years more for the total to pass $300,000,000, and in 1929 the payments exceeded $400,000,000.

Another Illustration

This increase can be shown equally strikingly in still other ways. Take the accruals per mile of line. They amounted to $182.19 in 1890. Yet in 1929 they reached $1614.46 per mile of line. They first exceeded $400 per mile of line in 1910; they passed $800 per mile in 1917, and they first reached $1200 per mile of line in 1922.

Similarly, comparisons may be made with the investment in railway properties. In 1890, railway tax accruals were $3.66 per $1000 of investment. In 1909 this figure first exceeded $6. Seven years later it had risen above $9. In 1920 it passed $14 and in 1929 it established a maximum of $15.81. Taxes have, therefore, far outrun investment.

In studying taxes, it is pertinent to trace these payments to their destination to determine their distribution between national, state and local objectives. In making such a distribution, it must be recognized that federal taxes vary widely because they are largely in the form of income taxes and fluctuate with railway net earnings. Local and state taxes, on the other hand, are more largely based on property and are, therefore, more uniform. With this explanation, it is interesting to note that in the last 13 years the proportion of the total tax payments of the railways going to the state and local governments has fluctuated between 71.9 per cent in 1923 and 96.6 per cent in 1931, figures for 1932 not yet being available. In only one year in this period did the state and local governments take less than three-quarters of the entire amount collected and for the entire period the proportion approximated 81 per cent.

Important as is the problem of reducing federal expenditures for taxation, it is evident that it is still more important to curb the expenditures of the local taxing units. This is illustrated by the trend in railway tax accruals since the peak year of 1929. In 1930, when the total taxes paid by the railways declined approximately $48,000,000, the taxes paid to the federal government actually decreased $50,000,000. In other words, in this year when federal taxes showed a measurable reduction, state and local taxation continued to increase. Similarly, in 1931, when there was a decrease of $31,000,000 in the amounts paid by the railways for taxes, more than two-thirds of this reduction came out of the taxes collected by the federal government, which amounted to less than

10 per cent of the total taxes paid by the railways.

What does such an increase in taxation mean to the railways? In 1932 the railways had left, after paying operating expenses, some $610,000,000. Of this amount, the tax collector took $280,000,000, leaving only $330,000,000 for those who had invested in the bonds and stocks of the railways. In other words, for every dollar of return earned on the railway investment in that year, the tax collector took 85 cents.

Working for the Government

Expressed in another way, in 1932 more than 1,000,000 employees, in effect, worked 168 of the 366 days for the tax collector, as compared with only 198 for the owners of the properties. In addition, the more than $26,000,000,000 of railway property was likewise used to the same extent for purposes of government. In other words, more than 460,000 railway employees, 120,000 miles of railway lines, 25,000 locomotives, 24,000 passenger train cars and 1,000,000 freight cars were working, so far as net earnings were concerned, for the tax collectors, local, state and national, rather than for the owners of the properties.

This is a situation that requires correction if the railways, and business in general for that matter, are to survive. No industry can long continue to function that is working more largely for the tax collector than for its owners. The problem is national. It is even more pronounced locally. The quarter of a million maintenance of way employees and the more than a million railway employees as a whole can wield a vast influence in curbing the inroads of the tax octopus on railway revenues if each one will interest himself in the problems of his local community.

SIDE DITCHES

Standardization a Distinct Benefit

TO a very large extent this is an age of standardization. In many of its phases and so long as it is not carried to the point of complete rigidity, the benefits are numerous and obvious. One example, known to every water service employee is the matter of threads for fire hydrants and hose couplings. It has not been long since every town that had a fire system used a different type or pitch of thread, with the result that hydrants and hose couplings had to be ordered specifically for each place. However, as these have been standardized it has become possible for a railway to carry a small stock of these fittings which are available immediately for use at any point.

As applied to track and roadway, order is likewise replacing chaos. Instead of the multiplicity of rail sections which prevailed only a few years ago, the American Railway Engineering Association now recommends only two sections heavier than 100 lb., one weighing 110 lb. and the other 131 lb.

Yet when we consider side ditches in cuts, we meet a different situation. These are not articles of manufacture or commerce, but are constructed in place, so that the question of interchangeability does not arise. Owing to the wide diversity of conditions to be met, including grades, length and width of cut, volume of water to be handled and character of soil, it is not possible, of course, to develop a standard ditch which will be suitable for every situation. A ditch that is satisfactory for steep grades may be entirely impracticable on a light grade and deep ditches may be required in places to handle unusual volumes of water.

These considerations do not, however, detract from the desirability of standardizing ditches. A standard section can be applied satisfactorily to all but a limited number of cases. If some standard is not provided, the size and form of the ditches will differ with each locality, the drainage will not be uniform and the appearance of the roadbed will be far less sightly. It is much better to have a standard that is adapted for the majority of cases and permit such deviations as experience indicates are necessary than to have a great variety of sections that are in no way correlated. In this application, as in many others, standardization is a distinct benefit. As in others, however, it can be applied so rigidly as to overcome some of its obvious value.

PAINTING

Do Not Allow Structures to Deteriorate

WHEN appropriations are restricted, one of the lines of slight resistance is to defer painting, on the theory that this can be left undone without serious detriment when there are so many needs that must be met with the money that is available. While it is true that this can be done with safety for a time, there is a limit to the extent to which it can be carried without detriment to the structures involved.

For this reason, bridge and building officers should consider seriously whether the interests of their companies will not be conserved by painting at least some of the structures which have been neglected in recent months. The exposed surfaces of frame buildings deteriorate rapidly after the condition of the paint has reached a point where it no longer protects them against the elements. If this deterioration is allowed to progress for any length of time, expensive repairs may be the price of the neglect, even though it may have been forced by circumstances which these officers cannot control.

Likewise, similar effects may result from the failure to repaint steel bridges. In this case, however, damage once done cannot be repaired. If it has progressed to the point where the load-carrying capacity is impaired, means must be found to strengthen the structure or, if the damage is more severe, to replace it. It is true that if a bridge was originally in good condition, it is unlikely that the effects are yet so extreme as to require either strengthening or renewal, but deterioration may have progressed beyond the point which should have been allowed, particularly in structures that were already "ripe" for repainting.

It may not be possible at present to do the complete job of painting that should be done. In this event, it would be well to consider whether it is not advisable to

apply single-coat work on the frame buildings which stand most in need of attention. There are experienced painters who advocate this as a matter of regular routine. It has been said that this can be done with no detriment to either the appearance or the ultimate condition of the surfaces so treated, and at less cost over a series of years.

In general, the appearance of bridges is not a matter of great importance. A complete repainting of these surfaces may not, therefore, be necessary. If the floor system is cleaned and repainted and the paint on other surfaces "touched up," this may meet the immediate needs of protection almost, if not fully, as well as a complete repainting.

This is not a matter of small importance that can be passed over lightly. It is one that should be given serious consideration and arrangements made to care for such structures as will suffer considerable deterioration if this is not done.

APPLIANCES

Their Use is No Longer a Novelty

THE reports of American railway officers of their observation of European railway practices during the last four or five years have indicated no little activity in the use of mechanical appliances on the English, French and German railways. However, a report on this subject which is purported to be founded on American practices as well as those of other continents, and which appears in the monthly bulletin of the International Railway Congress for January, 1933, tends to depreciate such developments. That the writer is not much impressed by the progress made in this country is indicated by his conclusions that "only a very small number of railway administrations have adopted definitely and generally mechanical methods of permanent way maintenance and renewal. The time that has elapsed since the introduction of these methods is too short for the results to be considered as definite."

Since the railways of America comprise no small part of the total railway mileage of the world, nothing could be further from the facts than such a statement. But since it is evident that the writer views the subject from the standpoint of European railways, it is an illuminating demonstration of the difference between practice and opinion here and abroad.

It is true that no progressive American maintenance officer is entirely satisfied with the results that he is getting from the power equipment that he is using. But this does not mean that he has any thought of reverting to hand methods. Rather, he is ambitious to improve the performance of his organization, and he realizes that the last word has not yet been said about power tools and the best manner of using them.

In some ways, the maintenance officer has become more conservative with respect to the introduction of new units of work equipment; however, this is not to be ascribed to any doubt in his mind with respect to the advisability of using power appliances, but to the fact that he realizes his responsibility as an advocate of the mechanization of maintenance of way work. He is satisfied that the policy is here to stay so long as it is founded on sound economic principles, and he knows that greater progress will be made only when the acquisition of new units and the application of the units owned are predicated on those principles.

The day of innovations in power tools for maintenance work is not over, but contrary to the view expressed in the above quotation, we are rapidly moving from the pioneer stage to that of established practice, in which efforts toward refinements in machinery and more extended use will command a great deal more attention than the development and introduction of appliances of a strictly novel character.

TREATED LUMBER

Use of This Material in Buildings Lags

THE preservative treatment of ties and members of wooden bridges is now so common as to be taken as a matter of course by most maintenance officers. Yet, despite the demonstrated economic value and widespread use of treated timber in these applications, relatively little treated lumber is employed in building construction, despite the fact that where it is being employed for this purpose, both experience and observation indicate that its use is practicable to a far greater extent than is the present practice.

Creosoted material is suitable for sills, floor joists and subfloors, as well as for mudsills and posts where these latter are used for underpinning structures that are not supported on masonry. Floors, studding, siding or other members which must be painted can be treated to advantage with zinc chloride or other salts which do not affect either the durability or appearance of the paint.

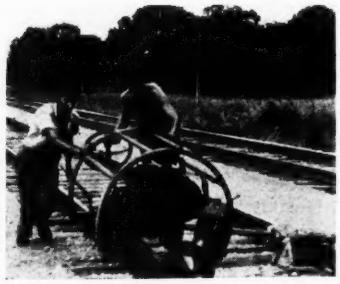
A definite advantage, in addition to protection against decay, in the use of treated lumber in building construction is found in its protective value against termite damage. The activities of this destructive insect are becoming more widespread year by year, with a corresponding increase in the damage it causes. While it is possible to take certain precautions that minimize the probability of termites entering a building, so far as present knowledge of methods of controlling this insect goes, the only completely safe method yet devised is to use creosoted lumber. For parts where the use of creosoted material is out of the question, treatment with one of the zinc salts offers the next best insurance against damage.

In the use of treated timber for bridges and ties, present practice presupposes that all timbers will be framed and bored before they are treated. This may not be done so easily in the case of building materials, but should be insisted on to the limit of practicability.

In view of the economic benefits which have been derived from wood preservation in the applications mentioned, it is to be expected that the use of treated material in building construction will become more general in the near future than it has been in the past. Building engineers and other officers interested in building maintenance will find it to their advantage to study this subject more closely than they have in the past.

Tightening Bolts as a System Job

Milwaukee uses special gang equipped with power machines to reduce cost and improve maintenance



The Time Required to Tighten Four Bolts and Move to the Next Joint is About Thirty Seconds

A NEW practice in the tightening of track bolts, which is demonstrating marked economy in this simple and elementary item of track maintenance, has been put into effect recently on the Chicago, Milwaukee, St. Paul & Pacific. As the practice is being applied, the section forces are relieved of this part of their routine work by a specially-organized gang which is equipped with power bolt tighteners and which moves from division to division over the important main lines of the system in accordance with a schedule which calls for a continuous sustained production.

In an effort to meet the greatly altered conditions which have occurred in recent years in track and roadway maintenance, and to develop methods whereby power equipment can be used economically and to advantage in the routine maintenance, this road began in 1929 to reorganize its section forces. At the same time it made a radical revision of its practices with respect to many routine maintenance operations.

Briefly this reorganization, which was described in the March, 1930, issue, page 119, provided that the section gangs should be reduced to skeleton units and that the men thus released be organized into special gangs for renewing ties, surfacing, etc. Under this plan the work of the section forces has been confined to the lighter tasks of track inspection, policing, renewing ties on sidings, tightening bolts, spot surfacing, lining and such other routine work as section gangs are expected to perform.

During the period since this plan was put into effect, a constant study has been conducted to determine whether methods can be developed to perform any of these remaining tasks more economically than they can be performed by the section forces, who obviously, must use hand methods.

Bolt Tightening Done More Effectively With Machines

As a result of this study, the tightening of track bolts was selected as a class of work that can be done more effectively by power machines than by hand. It did not appear, however, that there would be any economy in providing such machines for the individual sections, since their cost and upkeep would be out of proportion to the amount of work to be done. Furthermore, because of the relatively small amount of work to be done on any section, as compared with the potential output of a power bolt tightener, an individually assigned machine would be employed for only a few days in a year, so that such an assignment would be exceedingly uneconomical from this standpoint as well. Going a step further, the same objections applied to a roadmaster's district and to some extent to an operating division.

For some time the Milwaukee has also been employing system gangs for various intermittent maintenance operations, such as laying rail, ballasting, heat treating rail ends, welding battered joints, driving piles, etc. Since all of these gangs have demonstrated marked economies as compared with the performance under former methods, it was natural that the maintenance officers of the road should give consideration to the practicability of a similar plan for tightening bolts, particularly as it was apparent that there would be no economy in the assignment of power bolt tighteners to a limited territory. Consideration was also given to the fact that the quality of the supervision, the relative production and the standard of the work are likely to be lower for isolated units than where the operation is conducted on a scale large enough to justify provision for complete supervision.

Exhaustive Studies Were Made

It was decided, therefore, to organize and equip a special gang for tightening the bolts on the principal main lines of the system in the expectation that it would demonstrate similar economies. Before this was done, however, studies were made to determine the type of equipment and the number of machines most suitable for an operation of this character and the output that might be expected from each unit. One of the characteristics that was deemed necessary was that these machines should be as light and completely portable as is consistent with the requirements of the work.

As a further preliminary, the lines which it was desired to cover were charted and a schedule prepared which will permit the completion of one cycle of bolt tightening in two years. This period was selected in the belief that if the work is done properly, a general tightening will not be required again within this time. In the meantime it is expected that the few bolts which will need attention can be cared for by the section forces without interference with their other work.

As the gang is organized, it consists of a foreman and 10 men. Four Woolery bolt tighteners are assigned to the work, two men being required for the operation of each machine. On double track a machine runs on each of the four rails, tightening all of the bolts on that rail. On single track two machines work on each rail, each of which tightens every alternate joint. Two men precede the machines and tap down at the joints all spikes which might interfere with the placing on

the nuts of the socket wrenches with which the machines are equipped.

One man with each machine handles the gasoline engine, operates the clutch and spots the wrenches on the nuts. The other is a helper who assists in moving the machine to the next joint, helps to spot the wrenches, of which there is one on each side of the rail, and keeps a lookout for approaching trains.

As the machine reaches a joint it is quickly spotted and the socket of the wrench is fitted over the first nut. The clutch is thrown into high gear and as the tension in the bolt increases the engine slows down, the clutch being released at the proper moment to avoid stalling the engine. If necessary to straighten the nut, low gear is then thrown in to obtain the increased torsion necessary to bring the top horizontal. If the threads on the bolt are badly rusted so that the nut is "frozen," low gear is used to strip the thread or break the bolt. As soon as the first bolt in the joint is tightened, the wrench on the opposite side of the rail is applied to the next nut and the operation is repeated. These movements are made with extreme rapidity, the time required to tighten four bolts and move to the next joint being approximately 30 sec. The section forces are required to follow the gang and replace damaged and broken bolts.

Determining the Output of One Unit

In making the preliminary investigation, it was determined by experiment that the normal output of a single machine when working on four-hole angle bars, taking into account probable delays, was slightly more than 100 joints an hour. Accordingly, the schedule was prepared on this basis, with 3,200 joints a day as the normal output for the four machines, and this rate has been maintained in service, except through yards and terminals where interference from train and engine movements retards the work somewhat. When working on six-hole joints, there is some reduction in the number of joints that can be completed in a given time, although this is not proportionate to the added number of bolts, since there is no difference in the number of forward movements and set-ups at the joints as between the two types of joint bars.

Bolt-Tightener Crew—Schedule—M. E. Lamp, Foreman

Location	Track	M.P. to	M.P.	Track Miles	Joints	Date
Grand Ave. Jct., Milwaukee, Wis., to Oconomowoc	E&WB	88.3	118	59.4	19,000	July 29 to Aug. 4
Oconomowoc, Wis., to Watertown	E&WB	118	131	26	7,800	Aug. 5, 6
Watertown to Astico	E&WB	131	146	30	9,000	Aug. 8, 9, 10
Astico to Portage	E&WB	146	178	64	18,000	Aug. 11 to 17
Portage to Camp Dougl s	E&WB	178	227	98	26,560	Aug. 18 to 24
La Crosse, Wis., to La Moille, Minn.	E&WB	1	18	34	9,214	Aug. 25, 26, 27
La Moille to Wabasha	E&WB	18	60	84	26,900	Aug. 29 to Sept. 7
Wabasha to Red Wing	E&WB	60	89	58	15,800	Sept. 8 to 13
Red Wing to Hastings	E&WB	89	109	40	10,840	Sept. 14, 15, 16
Hastings to St. Paul Park	EB	109	121	12	3,600	Sept. 17
Newport to St. Paul	WB	122	130	8	2,400	Sept. 19
Chestnut St. to Minneapolis Depot	E&WB	131	139	16	4,336	Sept. 20, 21
Total				529.4	153,450	

During the preliminary work it was thought that it would be desirable to determine the proper degree of tightness and then insure that all bolts be brought uniformly to the required tension. This degree of tightness was arrived at by a series of experiments in which the nuts were turned up by means of hand wrenches. The machines were then geared so that the maximum torque which the engine will produce at the wrenches when in high gear results in the desired tension in the bolts. For this reason, it is unnecessary for the operators to make adjustments in the transmission or depend on their judgment with respect to the proper degree of tightness. They apply the socket of the wrench to the nut, throw in the high gear clutch, permit the wrench to turn until the speed of the engine is reduced almost to the point of stalling and move immediately to the next bolt or joint.

How the Work Is Programmed

To illustrate the method used in programming this work, the schedule for that part of the line from Milwaukee, Wis., to Minneapolis, Minn., is given in the accompanying table. This line is double track, and the bolts are to be tightened on both tracks except from Hastings, Minn., to St. Paul, 20 miles, where the railway owns one track of paired double track, and includes 529.4 track miles containing 153,450 joints, an average of 290 joints to the mile. The schedule calls for the work on this line to be done in 47 working days or at the average rate of 3,265 joints a day, and requires a regular advance of 11.35 track miles a day.

On Double Track the Machines Work in Pairs

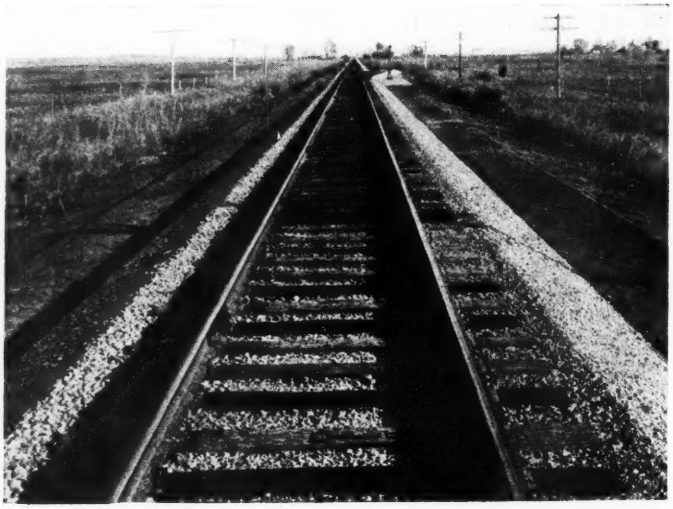
Progress Meets Expectations

This road has used power bolt tighteners for several years with satisfactory results in connection with the laying of rail. While the present operation has been conducted in an organized manner for only a limited time, the progress thus far has been up to expectations. Although it is too early as yet to state definitely what the final results will be, the tests that were made during the investigation, as well as the performance of the bolts on the new rail, which were tightened in this manner, give promise of satisfactory results, while the cost per joint is $0.017 for 4-bolt joints and $0.0186 for 6-hole joints, a marked reduction as compared with the cost of doing the work manually even under the most favorable circumstances. These costs include all labor, material and supplies and overhead items. The latter includes interest, depreciation and maintenance of the machines, rental of camp cars and the cost of supervision.

This plan does not contemplate any further reduction in section forces, but by eliminating this part of their work, it gives them additional time to apply to other necessary tasks. It is also expected that track conditions will be improved by the fact that all bolts are well and uniformly tightened, a result that is seldom or never accomplished by hand methods, and that fishing wear and batter at the rail ends will be materially reduced.

This plan was developed and applied by M. D. Bowen, superintendent of work equipment and welding, under the direction of W. H. Penfield, engineer maintenance of way.

Does It Pay to Treat Timber?



Economic value to the railways of wood preservation now and in the future is strongly affirmed

By EARL STIMSON
Chief Engineer Maintenance,
Baltimore & Ohio, Baltimore, Md.

[That the use of treated timber by the railways, particularly of treated ties, has not only demonstrated large economies which may be expected to increase in the future, but has been in part their salvation during the last three or four years, was the theme of a paper presented by Earl Stimson, chief engineer maintenance of way, Baltimore & Ohio, before a joint meeting of the Western Society of Engineers and the American Wood Preservers' Association during the annual convention of the latter body at Chicago on January 24. Mr. Stimson traced the history of wood preservation in the United States, reviewing the early efforts in this field. The first organized effort to treat timber on a large scale, however, was made by the Louisville & Nashville in 1875. An abstract of the remainder of his paper, as well as of the discussion follows.—Editor]

THE Louisville & Nashville built a plant for treating timber with creosote by the pressure process at West Pascagoula, La., in 1875. Piling, stringers, and caps for the construction of docks, wharves and trestles along the seaboard, as well as ties, were treated at this plant. Shortly thereafter, in 1879, a pressure plant was built by the New Orleans & North Eastern for treating with creosote timbers to be used for building a trestle across Lake Pontchartrain. These two instances were the beginning of effective treatment in this country. That these plants did good work is shown by the fact that long-leaf yellow-pine ties treated at the L. & N. plant and inserted in 1877 and 1878 remained in track until 1905.

The Lake Pontchartrain trestle was finished in 1883. The portion across the lake, 5.82 miles long, was built of creosoted yellow pine, in which not less than 15 lb. absorption to the cu. ft. was specified. The report of the structural engineer of the Valuation division of the Interstate Commerce Commission, of an inspection made in 1918 says: "A very remarkable state of preservation. The original timber is in good condition and apparently was carefully selected and well creosoted. Estimated remaining service life of trestle 35 years." As the trestle was 35 years old at the time of the inspection, this estimate would give a total expected life of 70 years. It is now 50 years old, and a recent inspection shows that approximately 50 per cent of the original timber is still in the structure. While the prophecy of 70 years' life made in 1918 will fall short of fulfillment, the record for long life of the treated timber in this structure is an outstanding one.

Other Bridges Have Long Life

Other instances of early treatment of bridge timbers will be cited: The Texas & New Orleans has several ballast-deck pile trestles built in 1890, of yellow pine treated will full-cell creosote, still in service after 43 years. The Southern Pacific has a number of creosoted Douglas fir trestles built from 1896 to 1900, which are in good condition, some having required no repairs and others only light repairs. The Santa Fe also has creosoted timber trestles dating back to 1898, which are in a good state of preservation, with an expectancy of several years' additional life.

My own experience dates back to 1910, when the Baltimore & Ohio completed a ballast-deck pile trestle in the Wabash river bottoms, west of Vincennes, Ind. The piling was red oak, treated with creosote by the Lowry process with an average retention of 10.6 lb. per cu. ft. The remainder of the timber was long-leaf yellow-pine, treated with an average of 9.2 lb. per cu. ft. The work was completed early in 1910, so the age of the structure is now 23 years. The first dollar has yet to be spent on maintenance and from a recent inspection, I find that it will still be several years before it will be necessary to make any replacements.

Other similar examples might be given, but these suffice to show that long service may be obtained from timber that is properly prepared and treated with a sufficient amount of a good preservative. While these examples are all of timber treated for structural work, during these years the treatment of crossties had been progressing, having developed to the greatest extent in the South and West, where the character of the timber

and the climatic conditions result in short life for untreated ties. Mountain pine, an inferior timber, was about the only timber available for ties in the West and the ties lasted 5 to 6 years in track. Treatment in quantity began about 1885, using zinc-chloride and a solution of glue and tannin. The zinc-chloride was injected first and then the glue and tannin, the latter being intended to seal the outer wood cells to prevent the highly soluble zinc-chloride from leaching out. This was known as the Wellshouse process. Previous experience had shown that while zinc-chloride is, in itself, a good preservative, its effectiveness is short-lived when used alone, particularly in regions of heavy rainfall where the successive wettings of the ties rapidly dissolve the salt. The use of the zinc-tannin process about doubled the life of the ties, bringing it up to an average of 12 years.

Another process, known as the Card process, was soon introduced, which uses a mixture of zinc-chloride and creosote, injected in one operation. This process has the advantage that it uses creosote, the best of all the wood preservatives, as the seal and offers the economy of injection in a single movement instead of two. These processes, as well as straight zinc-chloride, have been used extensively, and many millions of ties have been treated by them. The Card process provided a more effective treatment, undoubtedly due to the combination with creosote, and longer life may be expected from its use.

The Baltimore & Ohio began treating ties in 1913, using the Card process, the mixture being such as to give a retention of ½ lb. of dry zinc-chloride and 3 lb. of a creosote water-gas tar mixture, to the cubic foot of timber. This treatment was continued until 1927, when we adopted a creosote-petroleum mixture and the Reuping process. At present, our renewals are all of Card-process ties and a few untreated ties that have survived. The record of renewals to date indicate that we will get at least 20 years' service from these ties. Treatments using zinc-chloride, either alone or in combination, no doubt met the demands of economy in the regions and under the conditions where they were used.

Timber Must Be Protected Against Mechanical Failure

To obtain full benefit from the creosote treatment and effect ultimate economies sufficient to justify the greater cost of that preservative, it is necessary that the service life of creosoted ties approach the service life that has been obtained from the creosoted bridge timbers. To do this, it is necessary to protect the tie against destructive agencies other than decay. It should be made from carefully selected timber, preferably of the harder species and of those structurally strong, as it is required to withstand crushing of the loads and the wearing of the rail and ballast. The best of preservatives will not protect the tie against these mechanical forces. For a tie made from softwoods that are structurally weak and break down under service, the economical treatment is one that will insure protection from decay until it is worn out and fails from the rough usage to which it is subjected by the wheel loads passing over it. For such ties, the cheaper preservatives, such as zinc-chloride, or its combinations with tannin and creosote, are the economical ones to use.

Treatment with creosote offers the greatest economies for ties made from the hardwoods, such as oak, beech, long leaf yellow pine, etc. These woods have sufficient strength to withstand the wear and tear of traffic, and when protected with large tie plates, can resist the cutting action of the rail. For these reasons, the problem becomes only that of protecting against decay.

It took some years for the treating of ties to become a general practice. It may be said to have had its beginning in 1885. Fifteen years later, in 1900, only 2,800,000 ties, or 3.2 per cent of the 85,000,000 used, were treated. In 1910, this had increased to 30,544,000, or 20.6 per cent of the total of 148,231,000 ties used. By 1920, the percentage of treated ties used had increased to 43.5 per cent, and in 1930 to 78.5 per cent. The percentage of crossties treated with creosote to total ties treated in 1930 was 82 per cent. For the other classes of timbers treated, the use of creosote was practically 100 per cent.

These figures show that the economic necessity for prolonging the service life of timber was recognized by the railways and that preservative treatment was adopted as the necessity was forced on the individual companies by the depletion of the timber supply, by the increased costs of timber and of the labor for applying it, and by the realization that it is a good investment to spend more money for a while in replacements and thereafter enjoy the benefits of reduced annual costs. The fact that so many railways did this has been of incalculable benefit to them in the past three years, as the reduced tie renewals required by reason of the large percentage of treated ties in track has made possible an enormous saving in maintenance of way expenditures.

Crossties Provide Index of Economy

Since crossties comprise about 60 per cent of the total amount of timber treated annually, they should provide an accurate index of the economies that may be effected by the use of treated timber. Records of the renewals on 27 of the principal roads of the country that have been using treated ties for 15 years or more, show that the average annual renewals per mile of track for the five-year period ending with 1911 were 249 ties and for a like period ending with 1931 the renewals were 163 ties, a reduction of 86 ties per mile, or for the 200,492 miles of track represented by these 27 roads, a reduction of 17,242,312 ties per year for the five-year period. More startling are the figures for the single years 1911 and 1931. For 1911, the renewals were 262 ties per mile, while in 1931 they had fallen to 117, a reduction of 145 ties per mile, or a total difference of 29,071,340 ties for the 27 roads for the year 1931. If no treated ties had had been used on any of these roads, it is reasonable to assume that the 1931 renewals would have been at least as heavy as those of 1911. On this basis, using untreated ties in renewals in 1931, at an average cost of $1.40 in track, and using $2 for the average cost of the treated tie, there was an actual cash saving of $26,635,337 in the operating expenses of the 27 roads for the year by the use of the treated ties.

To some of the roads, the proportional saving is much greater, as their tie renewals fell below 100 ties per mile, the lowest being 46 ties per mile. As the 27 roads making up the renewal records just referred to comprise less than one-half the track mileage in this country, it is safe to say that the saving for all the roads is about double the amount given above.

Several years ago C. C. Cook, a past-president of the American Wood Preservers' Association, stated in a paper before the National Committee on Wood Utilization of the Department of Commerce, that the roads were then saving $145,000 per day by the use of treated timber, and that when all ties in track are treated, if an average life of 20 years is attained, this daily saving will be $287,000. There is ample proof that the 20 years' service life will be reached and exceeded. That this is already a fact is supported by the accurate records of

a number of roads from which I will give several representative examples.

The experience of the Chicago & Eastern Illinois with treated ties dates back 32 years. This road has reduced its annual renewals from about 300 to around 110 to the mile. During the past 15 years the average annual renewal has been 4.09 per cent of the total ties in track, indicating an average life of 24.4 years. This was obtained from a combination of zinc treated and creosoted ties, with some untreated. The untreated white oak ties on this road had an average life of 9.8 years. The Big Four record, which started in 1905, indicates to date an average life of 26.6 years for ties creosoted by the Lowry process.

The Lehigh Valley has had an experience of 22 years with creosoted ties, and renewals have been below 100 per mile for the past six years. This same record has been attained by the Central of New Jersey and the New York Central Lines West, while the Delaware, Lackawanna & Western excels it by two years, as the renewals on that road have been below 100 per mile for the past eight years. These roads are maintained at high standards, the ties being well protected by large tie plates, and a maximum life may be expected for the ties of well over 20 years and more likely around 30 years.

But to get full economy from treatment, the start must be made with carefully selected sound timber of a kind that will stand the pounding of the traffic it must carry. The ties should be pre-adzed and bored; structural timbers should be pre-framed. Much of the value of the treatment may be lost by failing properly to protect the ties against mechanical wear in service and abuse in handling. It is essential to use a tie plate of sufficient bearing area to prevent the crushing of the fibers of the wood, preferably fastened to the tie by lag screws to prevent movement of the plate on the tie. The ballast should be kept well drained and away from the top of the tie to prevent grit from working in under the plate and thus become an abrasive agent to hasten the destruction of the tie.

Efforts to protect the treated tie and get the maximum return from the treatment have resulted in a general improvement in the standard of track maintenance, since the longer life of the ties, which lessens the number of yearly renewals, has decreased the amount of disturbance of the track in making these renewals each year.

Owing to the manner in which railroad accounts are set up and to the several items of indirect costs and savings entering into the calculation, it is almost impossible to determine the actual economies effected by the use of treated timber. Generally they are calculated from an assumed hypothesis, using various formulas to determine annual costs involving interest, insurance, compound interest, sinking funds, capitalized annual charges, etc. Varying results are obtained from the various formulas and even the experts are not in agreement as to the proper one to use. For these reasons, I have felt that the subject could be presented more convincingly by a recital of the actual results that have been obtained, than by presenting formulas based on these hypotheses.

Discussion

In the lively and extended discussion which followed the presentation of this paper, considerable stress was laid on the reductions that have been possible in the cost of track maintenance during the last three years as a result of the large number of treated ties in service, as compared with the expenditures that would have been necessary if these ties had been untreated. Dr. Herman von Schrenk, consulting timber engineer, cited the experience of one of the roads with which he is connected, on which the tie renewals during 1932 averaged only 11 to the mile, and stated that, while this low figure cannot be continued indefinitely, it represented a complete renewal of all ties whose service life had expired up to the end of the year. Figures that were given for other lines ranged from 34 to 91 to the mile, while on districts where only a small percentage of the ties are treated, the renewals ranged well above 200 to the mile.

Doctor von Schrenk also enlarged on the point made in Mr. Stimson's paper that all phases of the economy of treatment should be studied before deciding on the method of treatment and the preservative to be employed. As an example, he said that it would be wasting money to treat a tie so that it would not decay short of 20 or 30 years, when it might be expected to fail from mechanical causes in much less time. Conversely, there is no economy in treating only to retard decay for a given number of years if the tie or other timber can otherwise be expected to last for a much longer time. He also stressed the desirability of giving every reasonable protection to the timber after it is in the track or structure, to minimize the effects of the mechanical forces to which it is subjected. He said that several roads now have reasonably stabilized renewals that indicate an average life approaching 30 years.

Systematic Education Recommended

As one of the important factors in the economies of timber treatment, J. G. Stuart, assistant purchasing agent of the Chicago, Burlington & Quincy, called attention to the fact that the potential benefits from treatment cannot be fully realized unless definite measures are taken to insure proper handling of the treated timber both before and after it is applied. Ties should also be protected from mechanical destruction during their service life by the use of tie plates of ample size, and by other methods which may be necessary to minimize this form of deterioration. He advocated the preframing of all timber, so far as practicable. He also dwelt on the need for systematic educational work among supervisors, bridge and building foremen and section foremen to impress on them the importance of proper handling, application and later maintenance in conserving the service life of the material.

Considerable interest was aroused by C. R. Knowles, superintendent water service of the Illinois Central, who related the experience of this road with creosoted water tanks. Starting about 1912, creosoted frames were applied to a number of tanks and the results were so satisfactory that it was decided to use creosoted material in the tubs also. This practice has been extended, until at present 140 such tanks are in service. All parts are creosoted and, except the drop siding on the frost box and the roof sheathing, all are pre-framed. In the beginning, there was some hesitation about adopting this construction because of the possible fire hazard. Experience has demonstrated, however, that this fear was unfounded, since the fire loss in tanks of this type is proportionately lower than in those constructed of untreated timber.

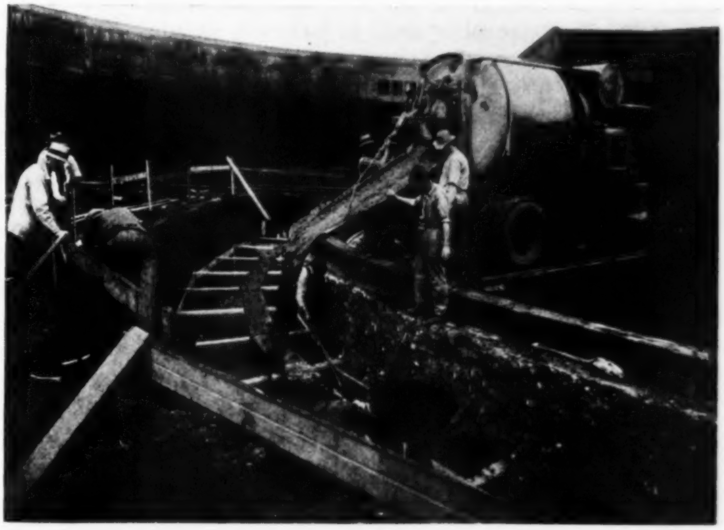
During this part of the discussion, the question was raised as to the practical possibility of painting creosoted surfaces. It was brought out that paint compounded of oil and the pigments commonly employed cannot be used successfully on creosoted surfaces, since the creosote bleeds through and stains the paint. It was stated, however, that aluminum paint, in which the vehicle is a good

(Continued on page 189)

Innovations Feature Renewal of Turntable

Project on Peoria & Pekin Union characterized by unusual design and method of installation and the use of ready-mixed concrete

INNOVATIONS in the design and method of installation and the use of ready-mixed concrete in the circle walls were features that characterized the renewal recently of a turntable on the Peoria & Pekin Union at Peoria, Ill. The project involved the replacement of a balanced type turntable, 85 ft. long, serving a 34-stall engine house, with a 100-ft. continuous type turntable in the same location. Since the engine house was in active use it was necessary that the construction interfere as little as possible with engine movements and that the old turntable be kept in service throughout the entire operation as nearly as it was possible to do this.



A Batch Truck Discharging Concrete Into the Circle-Wall Forms From the Turntable

Building New Circle Wall

Excavation for the additional width of the pit was made in five sections, using a locomotive crane located on the turntable,, the excavated material being loaded into cars spotted nearby, which were moved out each night. When a section had been excavated, the concrete circle wall and pit-rail foundation for that section were placed before excavation of the next section was begun. The old pit wall was left in place and as the new wall was completed and developed sufficient strength the tracks were cribbed across the gap between the old and new walls and the portion of the engine house served by these tracks was returned to service.

Because of the congested location of the work, there was no space available for the storage of concrete materials and, as a consequence, the use of ready-mixed concrete for the circle wall was adopted. The concrete was hauled about 1¼ miles to the job in batch trucks, where it was placed by driving the trucks onto the turntable and rotating the table to the point where it was desired to discharge the concrete.

The concrete was purchased by weight instead of volume and frequent tests were made to determine the weight of the batches. Inspection of the concrete as to the proportioning .of the aggregates was made at the central plant by a representative of the railroad and a certificate was furnished with each batch, showing what it contained. This method of buying and placing concrete was found to be very satisfactory and an excellent job was obtained with a minimum amount of labor, it being necessary for the railroad to furnish only three men for placing the concrete.

The design of the turntable itself represents a departure from conventional practice in that the usual built-up type of girders are replaced with wide-flange structural beams. These members consist of two 36-in. 280-lb. beams, 99 ft. 11¾ in. long, which are tied together with cross frames consisting of ⅜-in. plates or diaphragms fastened to the beams with 3½-in. by 3-in. by ⅜-in. angles and stiffened at the top and bottom with horizontal angles of the same size. Lateral bracing between the cross frames consists of 3½-in. by 3½-in. by ⅜-in. angles which are provided at both the top and bottom of the beams in the end panels and at the top only throughout the remainder of the length of the structure. The ends of the main beams are strengthened with reinforcing plates and stiffening angles. At the center, the supporting structure between the main girders consists of two transverse 30-in. 122-lb. CB-beams spaced 2 ft. 6 in. center to center, and two 27-in. 112-lb. CB-beams extending between the larger beams longitudinally with the turntable. The latter members are for the purpose of carrying the load directly to the roller-type center.

Wide Flange Beams Have Advantages

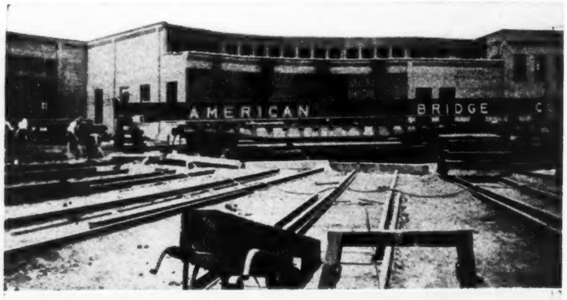
The use of the wide-flange beams in the turntable not only reduced the depth of pit required, but offered certain other advantages. Shop fabrication work was greatly simplified by the elimination of many riveted connections and resistance to rust and corrosion is increased by the use of the heavy beams and solid diaphragms and the elimination of many light angles. Moreover, such a design provides fewer places for the accumulation of dirt and makes it much easier to paint the structure.

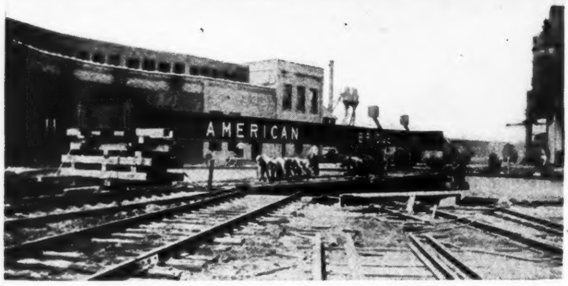
The circle rail for the turntable is of 130-lb. section and is supported on the concrete on metal plates, being fastened with adjustable rail clips. The pit wall is

rimmed for its entire circumference with 8-in. 54-lb. H-beams. Power for the operation of the table is furnished by two 15-hp. motors, which operate a tractor at each end.

Placing the New Table

In setting the new turntable into place the procedure adopted was to spot two flat cars carrying the new turntable on the old table and then to crib up the ends of the new table in order to remove the flat cars. The old table was then dismantled by burning through the cross-bracing between the girders, so that one girder could be removed from beneath the new table on each side, after which the latter could be jacked down into





Above—The New Turntable Was Moved on to the Old Table on Flat Cars. Below—Dismantling the Old Structure in Preparation for Lowering the New Table Into Position

place. The girders of the old table were each cut into five pieces and removed from the pit by a locomotive crane. This procedure was permissible because the old table was of no value to the railroad and was to be disposed of as scrap.

Work Simplified

The work of renewing the turntable was considerably simplified by the fact that the old center was provided with a capstone, of which the top was somewhat higher than was necessary for the new center and by the further fact that the center foundation was in good condition. Under these conditions the procedure was to remove the old capstone and adjust the new center to the proper height with high-early-strength concrete. Well-compacted cinders are used on the floor of the pit in preference to concrete as it was thought that better drainage and a cleaner pit would be obtained.

The idea of using the wide-flange beams in place of built-up girders was developed by E. H. Thornberry, chief engineer of the Peoria & Pekin Union, and the table was installed by company forces under his direction. The plans were drawn by the Missouri Bridge & Iron Company in collaboration with the American Bridge Company and the table was fabricated by the latter company.

Railways Make Track Awards

IN accordance with established custom, a number of railways have made awards to their track supervisors and foremen for excellence in the condition of the tracks under their supervision, as determined by annual inspections. Summaries of the awards on five railways, namely, the Chesapeake & Ohio, the Delaware & Hudson, the Erie, the Norfolk & Western and the Central region of the Pennsylvania are presented below.

C. & O. Made Careful Inspection

As the result of the annual track inspection on the Chesapeake & Ohio in 1932, including the Hocking Valley, cash prize awards were made to a considerable number of supervisors and foremen. Prizes of $50, $40 and $30, respectively, were awarded to supervisors with the highest ratings in five groups set up, except that in three of the groups, the third prize was omitted, and in one of these latter groups, the second prize was also omitted. First and second prizes of $25 and $15, respectively, were also awarded to the foremen having the best maintained sections on each supervisor's territory, and two special prizes of $50 each were awarded to the supervisors whose territories showed the greatest improvement during the year. In the following is given the names of the supervisors who won the first prizes:

Group 1—First prize—W. P. Nichols, Ohio River subdivision; second prize—J. H. Arthur, Cincinnati subdivision; third prize—J. L. Brightwell, Huntington subdivision.

Group 2—First prize—F. P. Berrick, Paintsville subdivision; second prize—R. R. Burchett, Barboursville subdivision; third prize—O. M. Smith, Logan subdivision.

Group 3—First prize—R. H. Gibson, Mountain subdivision; second prize—E. J. Eastin, Miami subdivision.

Group 4—First prize—E. G. Holesapple, Greenbrier subdivision; second prize—B. Jackson, Coal River subdivision.

Group 5—First prize—F. A. Dirnberg, Maumee subdivision; second prize—J. W. Knapp, Jr., Russell division.

The improvement prize awarded among the supervisors of Groups 1 and 2 jointly was given to O. M. Smith, who also won third prize in Group 2, and the improvement prize awarded among the supervisors in Groups 3, 4 and 5, jointly was given to J. W. Knapp, the winner of the second prize in Group 5.

Usual Awards Made on D. & H.

Thirty-two foremen on the Delaware & Hudson received prize awards, totaling $1,800, as the result of the annual track inspection held on that road in 1932. As in the past, ratings were established for every roadmaster's, supervisor's and foreman's territory, the ratings being based on the physical condition of the various territories. The prizes awarded were as follows: First, second and third prizes of $50, $25, and $15, respectively, for the three best main-line sections on the system; first, second and third prizes of $100, $75 and $35, respectively, for the three best branch-line sections on the system; first, second and third prizes of $100, $60 and $35, respectively, for the three best-maintained main-line sections on each of the four main divisions of the road; first, second and third prizes of $100, $75 and $35, respectively, for the three best first-class and three best second-class yards on the system; and first and second prizes of $50 and $25 respectively, for the two sections on each of the four divisions which showed the greatest physical improvement during the year.

The foreman winning the first prizes in the various

classifications, together with their various ratings, are given in the following paragraph:

Best main-line section on the system, P. Farro, Susquehanna division, Maryland, N. Y., with a rating of 97.00; best branch-line section on the system, V. Santarcangelo, Saratoga division, Ballston Lake, N. Y., with a rating of 92.61; best main-line section on the Champlain division, N. Deso, West Chazy, N. Y., with a rating of 96.43; best main-line section on the Saratoga division, J. Corsale, Saratoga, N. Y., who, with a rating of 96.98 (also won the second system main-line prize); best main-line section on the Susquehanna division, P. Farro, who won the first system main-line prize with a rating of 97.0, as indicated above; best main-line section on the Pennsylvania division, W. Warner, Windsor, N. Y., with a rating of 91.98.

The first prizes for the best first and second-class yards on the system were won, respectively, by A. Powell, on the Susquehanna division, at Oneonta, N. Y., with a rating of 99.03, and S. Dismore, on the Champlain division, at Port Henry, N. Y., with a rating of 96.41. The first prizes on the different divisions for those sections showing the greatest improvement during the year were awarded to M. Alteri, on the Champlain division, at Crown Point, N. Y.; L. W. Rose, on the Saratoga division, at North Creek, N. Y.; George Russell, on the Susquehanna, at Nineveh, N. Y.; and A. Morella, on the Pennsylvania division, at Carbondale, Pa.

Certificates Awarded on Erie

Following its usual practice, the Erie made an inspection of its tracks in 1932, for the purpose of rating each section and district on the road, but, in that year, prize certificates were awarded to the winners instead of the cash prizes given formerly. First and second awards were made to the supervisors on each of the two districts of the road whose subdivisions received the highest and second highest ratings, and similar awards were made to those supervisors who maintained the best conditions on branch lines on the Eastern district. The supervisors who received these awards are given below.

Division	District	Award
	Eastern District—Main Line	
New York	W. H. Wahl, Campbell Hall, N. Y.	First
Susquehanna	W. E. McGuire, Binghamton, N. Y.	Second
	Eastern District—Branch Lines	
Tioga	R. E. Ruby, Elmira, N. Y.	First
Rochester	E. W. Trenholm, Avon, N. Y.	Second
	Western District—Main Line	
Marion	A. Burgett, Huntington, Ind.	First
Kent	G. L. Dunn, Kent, Ohio	Second

In addition to the above, a "Banner" section was established on each district and a considerable number of first and second certificate awards were made to the foremen whose sections received the first and second highest ratings on individual subdivisions. The "Banner" section award on the Eastern district was given to A. Lockett, foreman on Section 8 of the Susquehanna subdivision, and the "Banner" award on the Western district was made to C. W. Brady, foreman on Section 37 of the Mahoning subdivision.

Prizes on N. & W. Total $2,160

Eighty-four section foremen received prize awards on the Norfolk & Western as a result of the annual track inspection on that road for 1932, the total amount of awards being $2,160. As in the past, first, second, third and fourth prizes were awarded generally on each district, these amounting to $40, $30, $20 and $10.

The system rating for the year, on the basis of 10 as perfect, was established at 9.20, as compared with an average of 9.17 in 1931 and 9.16 in 1930. On the same basis of 10 as perfect, the highest rating given to any section this year, was to the section of A. C. Davis, at Tazewell, Va., which received a rating of 9.49. Mr. Davis' section was among the winners in 1930 and was awarded the highest rating of 9.48 in 1931. The second highest rating this year of 9.47 was awarded to the section of W. V. Crosby, Lockbourne, Ohio. The division receiving the highest rating for 1932 was the Scioto division, which had a general average of 9.30. The second highest division rating of 9.27 was given to the Roanoke terminal.

The highest rating given to any roadmaster's district was given to the Tug Fork branch of the Pocahontas division, with a grade of 9.37, this same district having received the district prize in 1931, with a grade of 9.31.

Results on the Pennsylvania

As was the case in 1931, there was some curtailment in the time and prominence given to the annual track inspections on the Central region of the Pennsylvania in 1932, but periodic inspections were made as usual, and announcement has been made of those subdivisions which received the highest ratings. Main-line Subdivision 12 of Pittsburgh division, headquarters at Trafford, Pa., of which C. J. Henry is supervisor, received, for the second consecutive year, the highest subdivision rating. The subdivision receiving the highest rating on the Eastern division was, for the second consecutive year, Subdivision 1, at Pittsburgh, of which D. E. Callahan is supervisor, and the subdivision receiving the highest rating on the Panhandle division was, for the second consecutive year, Subdivision 4, headquarters at Newcomerstown, Ohio, of which J. C. Dayton is supervisor.

Does It Pay to Treat Timber?

(Continued from page 186)

quality spar varnish, has given satisfactory results, and several instances were cited where painting of this character has been done to advantage. H. H. Houck, bridge engineer of the State Highway department of Alabama, stated that it is now the practice in that state, as well as in others, to install creosoted guard rails and posts at curves and on high fills, and cover them with aluminum paint, and that, because of the highly reflecting surface of the paint, these guards can be seen more distinctly at night than untreated guards that are painted white.

In summing up the discussion, C. C. Cook, maintenance engineer, B. & O., said that while the Pontchartrain trestle is probably not typical of the performance of the average creosoted timber trestle construction of the country, it is an outstanding example of what can be accomplished in extended life for such structures by careful attention to the selection of the timber which is to go into them, to the proper treatment of the material, to careful handling and installation, to proper methods of protection after construction and to maintenance. As an illustration, he described in more detail than was given in Mr. Stimson's paper, the experience with the creosoted pile trestle at Vincennes, Ind., which is now 23 years old, but which, as a result of careful preparatory work and care in construction, has not yet required any maintenance and gives promise of several years more service before the first repairs will be required.

Practicing Safety in the B. & B. Department*

The character and location of the work of this class of employees gives many angles to the problem of preventing accidents

By JOHN P. WOOD

Supervisor of Bridges and Buildings, Pere Marquette, Grand Lodge, Mich.

OWING to the fact that their work is frequently scattered over a considerable territory it is not always possible for bridge and building men to attend safety meetings, which are usually held at a central point and at times in the afternoon when it is impracticable for them to attend. They should, however, be encouraged to attend these meetings whenever it is possible and to take part in the discussions. If an employee's interest can be aroused to the point where he will take an enthusiastic part in these meetings, he will not only practice safety but will be alert to detect unsafe practices on the part of others and will call the offenders' attention to such practices. As he becomes imbued with the habit of practicing safety, he will be anxious to see his fellow employees acquire the same spirit, as he will then have a full conception of the benefits that will accrue if principles of safety are practiced by the entire group.

Records show that the greatest percentage of accidents involving personal injuries in the bridge and building department occur during the handling of the materials used in the construction of bridges and buildings, followed in importance by the fall of persons, the use of hand tools, and the collapse of objects, in the order named. For this reason it is the responsibility of the foreman to take extra precautions when his men are handling materials. He should make certain that the men are placed in such positions as to protect them from possible injury, cautioning them as to any movements that might cause them to lose their footing, and never permit them to move backward when it is possible to move forward.

Handling Materials With Mechanical Equipment

When handling materials with the aid of mechanical equipment, it is important that the men be taught to stand in the clear of moving objects and to make certain that the proper hitch is made when a line from a crane is being attached to a heavy piece. Moreover, only one man in the bridge gang should be designated to give signals to the operator of the machine and the members of the crew should never be permitted to give signals to the operator indiscriminately. The proper way to transmit signals is for a man on the ground to give them to another man on the machine, who will, in turn, transmit them to the operator. By adhering strictly to this practice, all persons concerned soon learn to realize its importance and the benefits to be derived from it. The careful foreman will always use extreme caution in placing his men and in the selection of men for the various duties to be performed, using those that are best adapted by ability and experience to perform the various tasks.

Injuries caused by falls usually occur because of carelessness on the part of the person injured. Injuries attributable to this cause would be reduced materially if all bridge and building employees would see where they stepped and would take special care in the presence of snow and ice, wet or slippery boards and carelessly-placed tools. When present in such places as to involve a hazard to workmen, snow and ice should be removed before the work is allowed to proceed. Wet or slippery boards should be covered or replaced and workmen should not place tools where there is a possibility of someone stumbling over them. Even the collapse of a scaffold is due primarily to the carelessness of workmen in not nailing or otherwise constructing it properly and allowing it to become overloaded with men or materials.

The proper use of hand tools should be given serious consideration by both the foreman of the gang and the supervisor of bridges and buildings. When he is in the field with a bridge or building crew, the supervisor should make it a practice to make a careful inspection of the tools being used by the men, in order to determine if any are battered, cracked or otherwise in such condition that they might be the cause of an injury. When he does find such tools, the supervisor should instruct the foreman to forward them immediately to the shop for the necessary repairs. Some foremen are careful to send such tools in for repairs of their own volition, while others neglect this important matter.

Injuries caused by falling objects may be avoided by a few simple precautions. Tools should not be left where the vibration of a moving train, a slight jar or the movement of another object will cause them to fall where men are working below. These precautions are also applicable to material which, in addition, should not be placed in such a manner that it is likely to fall when being picked up.

Collapse of Structures

While not so numerous as those caused in other ways, injuries resulting from the collapse of some facility or structure or the fall of tools or materials are, as a rule, of a more serious nature and frequently fatal. It is, therefore, vitally necessary when erecting scaffolds that great care should be exercised to determine that the bottoms of the uprights are set on a firm foundation and that the brackets are nailed securely. If necessary, the planks should be spiked to the ledges to prevent them

*Abstract of an address presented before the annual meeting of the National Safety Council and the Safety Section, American Railway Association, at Washington, D. C.

from slipping and no lumber should be used that is crossgrained or otherwise unsound, including that which contains knots that might cause it to break under ordinary loads.

Where they are not in daily use, ladders should be inspected carefully for possible defects before they are used. To prevent ladders from slipping the bottoms of the side bars should be equipped with steel spurs. No overload should be allowed on either ladders or scaffolds and care should be exercised in taking them down.

Rope that is used with blocks must not be allowed to get into such condition that it is likely to break when it is placed under a strain. Machine operators should be constantly alert for loose burrs, missing bolts and broken strands in cables, and should take care that friction drums, brakes and operating levers are in good condition at all times, as any one of these defects might be the cause of a serious accident.

Use of Explosives

Present-day methods require the use of many explosives and inflammable substances such as gasoline, kerosene, wood alcohol, paints, varnishes and turpentine in bridge and building work. Extreme caution should be used in the storage and handling of these substances, particularly gasoline. Men should not be permitted to smoke or to use other than electric lights in a car or building where explosives or inflammable substances are stored. While accidents resulting from gas explosions are not numerous, great care should be exercised in the handling of all such substances.

Falls Due to Insecure Footing Are a Source of Injuries

With the advance in our methods and appliances for doing work the electric motor has come into common use in our shops and even out on the line. The use of high-tension wires naturally followed and created a hazard to men working in the vicinity of these wires. Employees, therefore, should be careful not to expose themselves to injury from electrical shock.

Operators of motors should be instructed in the uses of the switch to start and stop them, and unless they are experienced electricians they should under no circumstances be allowed to make any repairs or adjustments when any trouble occurs.

The use of signs of various types has a definite place in accident prevention work. Signs can be made and used in various places to keep the safety idea constantly before the men and to instruct them in the safe performance of their duties. At a small cost, a sign can be made and placed on outfit cars showing the number of days since that particular crew has had an accident. As the days pass and no accidents occur, the men note this fact and develop a sense of pride that inspires them to keep their record clean. Another way to use signs in the interest of safety is to place a sign bearing a suitable slogan in full view of all workmen on the job. The slogan should be changed from time to time, to drive home different lessons; for example, the sign may be used to call the attention of the workmen to the fact that they have dependents who would suffer if they permitted themselves to be injured.

The Personal Factor

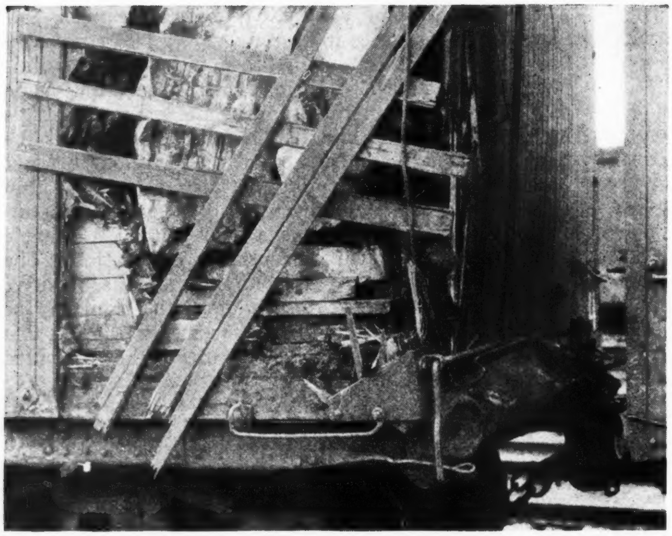
The personal factor is involved more closely in the cause of accidents than many now realize. Such factors as sickness in the family, unpleasant home surroundings, worries over financial matters, defective hearing, faulty coordination between the mind and muscles and habitual carelessness are all conducive to a poor safety record. The supervisor should take an interest in the personal affairs of each man in his department, for by so doing he may be able to assist in some manner those men who are in need of sympathy or advice. I believe that many of us little realize how far-reaching may be the effect of a kindly word spoken at the right time and in a friendly manner. Cheer up the spirits of an employee and he becomes a safer and saner one.

Dealing With the Habitually Careless

The habitually-careless employee deserves very little consideration and when the foreman becomes convinced that it is impossible to break such a man of his habits he should be placed in a position where his careless habits will not be the cause of injury to fellow workers or himself. If no such position is available he should be dismissed from the service. Such a man is a constant menace to those with whom he is working, and, as a consequence, they are always in a nervous state and fearful of what may happen.

It is often said that accidents occur in part at least because of a lack of proper supervision. This may be true in some instances, but, as a rule, it is not so. The supervisor has many duties to perform and a host of details to consume his time. The bridge and building gangs under his supervision may be widely scattered, making it impossible for him to visit them as often as he would like to, but regardless of these facts it is his province, when he has the opportunity, to talk with his forces on safety matters and to instruct them in safe practices. He should call their attention to practices in other departments which he considers unsafe, not in a critical manner but to call the attention of his men to the faults and failings of others so that they may profit thereby.

The supervisor should be very careful when criticising his men, as the average man is very sensitive and, if criticised in a thoughtless manner, may react adversely to the advice. Diplomacy and tact on the part of the supervisor when bringing to the attention of any employee some particular mistake he has made will usually have the desired effect and leave the employee with the thought that his superior officer has his best interests at heart. His respect has then been gained, which is essential to his becoming a safe workman.



Insufficient Clearance Between Tracks in a Yard Was the Cause of this Damage

Rough handling, derailments and the salvage of freight at wrecks are all factors in claim prevention with which the roadway department should be vitally concerned

Loss and Damage and the Maintenance Man*

By JOE MARSHALL

Special Representative, American Railway Association, Chicago

TO get a picture of loss and damage, one must take a long range view of it. The peak in loss and damage on the railways of the United States was reached in 1920, and amounted to $119,833,127. In 1931 it was $24,565,360. We have thus taken $95,267,767 from this bill in 11 years, or an average of $7,938,980 each year. That indicates an enormous saving, yet, in the 11 years since 1920, the railroads have had to charge to loss and damage a total of $494,389,096, or just short of a half billion dollars.

The work of the roadway department in providing better track, flatter grades and easier curves, has contributed to the faster movement of freight trains. Consequently, much that has been done to reduce losses due to rough handling has been offset by the effects of greater speed—for example, the greater damage that follows a derailment at high speed. There is also the influence of the greater difficulty which the engineman experiences in controlling the slack in a train when compelled to make emergency stops. How often are the track or bridge forces involved because of short flagging or because of a failure to give an understandable signal when a train must be slowed down for any reason? At such times the engineman is confused as to whether to stop or come ahead at reduced speed.

The same thought may apply to leaving motor cars on the track, until the train gets too close, while trying to get into a siding or to a more convenient point to unload. However, the responsibility of the man in the roadway department does not end when he gets his motor car in the clear. He has to stand by as the train passes him and he can perform no more valuable service during that time than to watch the train, looking not only for hot boxes and defects in wheels and brake rigging, but also for shifting or unstable loads.

Not many extra-gang or section men attend employees' rough-handling meetings, but I remember one meeting where an extra gang foreman was present. Some remarks by roadway men had been read, and after the meeting this foreman told me that up to that time he did not understand what good he could do in such a meeting but that thereafter he would help the cause.

I know no better method or place than these meetings to wash out differences and prevent failures, because the failures come up in the meetings rather than in practice, and the men learn how to co-ordinate their efforts to prevent them. Here are some of the defects in track that have been discussed at such meetings.

Switches that were hard to throw because they had not been cleaned properly.

Both switch points not fitting up properly.

An excessive amount of play between the goose neck of the switch stand and the main rod.

Bent and crooked head rods.

Key loose in the staff of the switch stand.

Worn bolt holes in the switch head rod.

Guard-rail clamps loose.

Frog points polished bright, indicating that wheel flanges are grinding the point of the frog, due to a wide flangeway at the guard rail or to tight gage.

Humps or low points in yard tracks, particularly at places where ties have been replaced.

Two adjoining switches at a crossover so close together that engines and crews must come right up to the switches before it is possible to see if they line up.

Switch stands too close to the rail on ladder tracks, compelling men to go between cars when passing the switch stand while cutting cars.

Where oil is used on joints, switch points, guard rails, sharp turnouts, or other places, too much oil causes car wheels to pick it up and cars cannot be stopped.

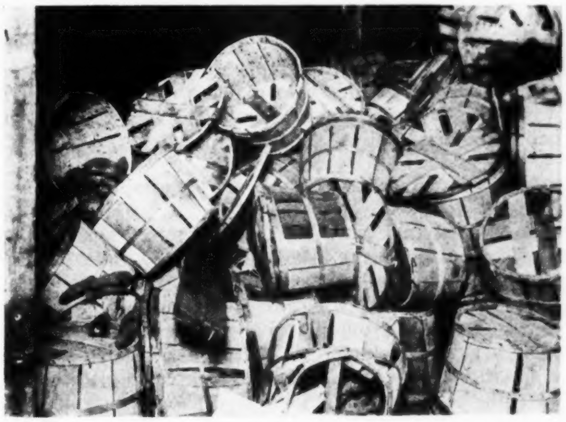
*From a paper presented before a monthly meeting of the Maintenance of Way Club of Chicago.

The whole job of preventing damage consists of unrelenting supervision to avoid failures of men, machines and methods. The men must help in this campaign against failures, and the only practical way of bringing this about is to have representatives of all departments meet together from time to time.

Clearance is another question which creates discussion, mostly because changes in clearance are not always reported promptly, and loads are accepted and then held up because of inadequate clearance. Because such delays result in claims, it is up to roadway forces to do their part in watching for cases of close clearance. The importance of delay as a factor in claim payment is indicated in the following table showing the loss and damage account for the 12 months ending with June 30, 1932.

Unlocated loss from bulk and from package	$ 903 324
Derailments	1 001 596
Delay	1 087 144
Defective Equipment	1 221 652
Unlocated loss and robbery entire package	1 336 014
Concealed Damage	1 991 347
Unlocated Damage and Rough Handling	12 841 019
Other Causes	1 640 387
Total loss and damage	$22 022 483

Wrecks are still the source of claims amounting to a million dollars per year. It is interesting to know that this account has been reduced every year; it is now



Loss and Damage Has Cost the Railroads a Half Billion Dollars in the Last 11 Years

practically one-fifth of what it was in 1921, but it still amounts to one million dollars. This item can be further reduced. Here is a list of the high spots in this account for 1931:

Commodity		*Per Cent of total*
Coal and coke	$ 99 722	10.0
Live stock	83 783	8.4
Fresh meat	69 737	7.0
Machinery	57 193	5.7
Fresh fruits	55 053	5.5
Vegetables	48 172	4.8
Petroleum oil	40 834	4.1
Iron and steel	35 061	3.5
Automobiles	33 425	3.3
Citrus fruit	29 748	3.0
Grain	25 449	2.5
Other products of mines	23 028	2.3
Vegetable oils	21 542	2.2
Flour	18 401	1.8
Melons	15 614	1.6
Tobacco	14 896	1.5
Lumber	11 686	1.2
Merchandise	116 287	11.6
Other manufacturers	125 387	12.5
Total Derailment	$1 001 596	

This list will indicate that much loss is due, not to damage by the wreck, but to the difficulty of recovering the freight after it is off the wheels, or on the ground. And as the maintenance forces are frequently required to aid in the salvage work, they have an opportunity to study ways of protecting and recovering the various classes of freight after an accident has occurred.

Train accidents are also of interest to the maintenance of way department because of their causes, as defined in Accident Bulletin 100 for 1931, of the Interstate Commerce Commission. The reason for watching passing trains is shown by the fact that 3,174 accidents resulted from defects or failure in equipment. Table 67 shows that 92 accidents resulted from improper loading. The high spots are:

Unequal distribution of load	34
Car overloaded	23
Load shifting	21
Loading falling on track	12
Other causes	2

There were only three accidents due to failures of bridges, trestles, culverts, or tunnels, but there were 47 cases due to defects in ties and tie plates, as follows:

Ties decayed and worn	32
Ties soft and poor quality	12
Ties broken	2
Tie plate broken	1

Here are the high spots from Table 66, Rails and Joints:

Broken rail	247
Rail spread—improperly spiked or braced	4
Rail spread—joints loose or improperly bolted	8
Rail gave way—worn condition	8
Other causes rail failure	62
Rail joint, angle bars, or bolts broken or defective	8

There were 275 accidents due to miscellaneous defects in track.

Soft track—not otherwise provided for	55
Improper surface of track	49
Uneven superelevation of track	36
Improper alinement of track	35
Improper gage	15
Excessive superelevation of track	14
Low joints	14
Track settling	13
Insufficient ballast	8
Excessive curvature	7
Guard rail improperly placed or secured	5
Insufficient superelevation	5

Frogs and switches were held responsible for 243 accidents:

Switch-point bent, or sprung	49
Switch-lug broken	41
Switch-point worn	24
Switch-rod broken, or disconnected	15
Switch point broken	12
Switch rod bent, or sprung	12
Keeper or latch, broken, defective, or missing	12
Stand or head block loose, broken, or defective	9
Lost motion in switch	4
Spiked switch working loose	2
Frog guard rail or fastenings, defective, missing, improperly placed or secured	16

The maintenance man not only lays the ground work, so to speak, for our railroading, but he does a lot of it under traffic, in which case his responsibility is greater than almost any other single man in service, because he must often produce his own orders out of his own experience and judgment. Good railroading reflects the fine application of expert judgment by hundreds of thousands of railroad men, on tens of thousands of different jobs, handling tens of millions of loaded freight cars, to and from some thirty thousand different places in our United States. Railroading is a big job, well done, and meetings like this help to make it so.

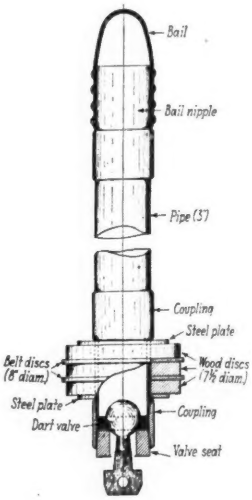
When a Well Fails*

By E. M. GRIME

Engineer of Water Service, Northern Pacific, St. Paul, Minn.

NOT infrequently in wells which derive their supply from water-bearing sand strata there is a marked decrease in production or, in some instances, a complete failure of the supply. This may occur at a relatively slow rate, or, as sometimes happens, suddenly with no advance warning. When failures of this type occur, since it is impracticable to bring up the bottom of the well for examination, no one can decide even approximately what the trouble is without first making a mental picture of the conditions at the well screen, which are causing the trouble. The correctness of this picture can be confirmed to a certain extent by studying the log of the well as originally drilled and by subsequent data on pumping rates, static head, dynamic head, sand production at varying pumping rates and other pertinent information which may be available in the particular case.

As a rule, in gravel and sand formations, each well will have its correct pumping rate. A lower rate will have no effect, but many wells have been irretrievably ruined by attempts to exceed the correct rate with consequent destruction of the water-bearing stratum.



A Surge Plunger

If the well under consideration is actually clogged with sand, we assume that sandy material has been coming through the screen for some time and has been steadily removed from the well by either regular pumping or other methods, but that now the flow has practically stopped and the screen is so clogged that sand does not come through. If water poured into the well disappears rapidly, it will indicate that the static water level has for some reason dropped below the level of the well. On the other hand, if the water will stand in the well to a certain height, it may indicate a filling up with sand of all of the water passages close to the screen. If compressed air is available, it may be possible to cap the top of the well pipe and apply sufficient air pressure to force the water out through the screen and thus open up the passages to restore normal flow.

Giving the Water a Surge May Help

By placing a valve on the well cover and alternately allowing water to escape and applying pressure, the water-bearing formation may be given a surging water movement that will clear the accumulation around the screen and restore the flow to normal. This method may be used safely, however, only on a comparatively deep well where it is known that there is a heavy blanket of clay or other impervious material overlying the water-bearing stratum, which is not likely to cave or be washed from around the well casing by the pressure on the water stratum below. If such a heavy overlying stratum does not exist, a well can readily be destroyed by the application of this surging method.

A Safer Plan Suggested

A safer plan for restoring the capacity is to have an experienced well man use his drilling rig to operate a surge plunger for the purpose of opening up or clearing the water passages. One of the most effective tools for this purpose is a combination of the ordinary bailer with Dart valve and plunger of the proper size to fit the well, as shown in the illustration. Having a log of the well and using good judgment with respect to the pumping rate, and with the plunger operating at such an elevation in the well as not to move the fine sand from the water-bearing stratum too rapidly, the driller will gradually lower the position of the plunger. By watching the output constantly and noting the turbidity by reason of the fine sand or clay that is being washed away from the screen, the proper pumping rate to secure the maximum quantity of clear water is finally determined and the well restored to normal usage.

Returning to our mental picture of the conditions at the bottom of the well, the thought occurs that possibly what seemed to be a well screen clogged with sand is in reality a bad case of calcium or magnesium-carbonate incrustation, which has cemented together a quantity of sand grains all around the screen in such a manner as to close the openings completely. Cases are not uncommon in which existing wells have been discarded and new ones drilled at considerable expense, when the trouble was due entirely to incrustation of the screen which might have been cleaned by a simple method.

Trouble May Result from Incrustation

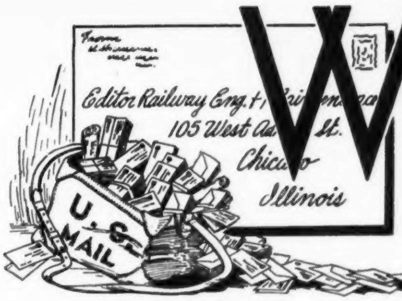
In view of this, when for no apparent reason, the flow of a well which penetrates a dependable water-bearing stratum, begins to diminish gradually, it is a good plan first to make a trial of cleaning the screen by saturating it with acid. For this purpose, it is desirable to use the highest gravity commercial hydrochloric acid. This has a specific gravity of 1.2 and will sink rapidly to the bottom of the well. A 1½-in. pipe should be run down to within 1 ft. of the bottom of the well, and sufficient acid to fill the screen completely should then be poured down this pipe as rapidly as possible. The idea is to fill the screen with the acid for its entire length before any considerable part of the acid eats its way through the incrustation at the lower end of the screen and thus becomes diluted with the ground water.

This acid will have practically no effect on the brass screen and little effect on the other screen materials or iron pipe. It will rapidly attack magnesium or calcium carbonate incrustation, however. Its action may be noted by a rapid succession of carbon dioxide bubbles rising to the top of the water surface. When these bubbles cease rising after a period of about 24 hr., the action will be practically completed.

If the trouble has been caused by incrustation, pumping at the end of this period will indicate some clearing of the screen. The flow will improve gradually for a few days, and if sufficient acid has been used, the disintegration of the clogging will be finally completed and the well restored to its normal capacity.

This is a method that is effective in probably 75 per cent of all cases of this kind of trouble. It accomplishes a first-class job at a fraction of the cost of drilling a new well; usually at a total expense less than that of merely moving a well-drilling rig to the site of the work.

*This discussion was submitted for publication in the What's the Answer department but because of its scope is presented here as an independent article. For further discussion of the subject, see page 198.



What's the Answer?

Have you a question you would like to have someone answer?

Can you answer any of the questions listed in the box?

Long Service from Falsework

Where a bridge pier or abutment requires renewal or extensive repairs, is it practical or economical to support the spans on untreated falsework and delay the repairs until full service life has been obtained from the timber? Why? What difficulties are involved

?

Depends on Several Practical Considerations

By JOHN L. VOGEL

Bridge Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

When necessary to support the superstructure of a bridge on falsework to provide for renewal or extensive repairs to the substructure, the question of maintaining the untreated timber falsework for its full service life will generally be decided by the character and amount of traffic which the bridge is required to carry. Furthermore, it is also necessary to consider the extent of the remodeling or strengthening of the superstructure that may be necessary over the temporary supports.

On main lines, if the span is short, it may be advisable to consider the service life of the falsework, provided no encroachment is made in the waterway or travelway. On branches where traffic is light and generally restricted, and encroachment is not a factor, it is advisable to consider the service life of the falsework.

If the falsework is to be maintained for the full service life of the material, the material must be selected and the workmanship of the best. As a general practice, we have never maintained temporary falsework for its full service life, but I believe that this question will have to be given careful consideration in the future, owing to the necessity of obtaining the fullest measure of return from every dollar spent in maintenance.

Has Done This in Several Instances

By C. C. WESTFALL

Engineer of Bridges, Illinois Central, Chicago

No general answer can be given to this question, because local conditions may make it impracticable to obstruct a roadway or waterway with falsework beyond the minimum time to do the work in more permanent form. Again, from a traffic standpoint it may be objectionable to carry spans on falsework for a considerable time. A chief consideration is sometimes whether traffic conditions will permit the construction and maintenance of the semi-permanent form of falsework that may be necessary.

It can be assumed generally that if a long clear span is required, falsework of the usual type, extending throughout the length of the span will be unsatisfactory, because of the restriction to the opening. Accumulations of drift or ice might cause destruction of the falsework, while they increase the danger of scour around the foundations, which would already be aggravated by the presence of the pile bents.

I have found it most economical and desirable to carry the end or ends of the span or spans which rest on the pier or abutment, on temporary pile piers, consisting of a bent or a group of bents driven on each side of the masonry pier or abutment. In this case we carry the load on a grillage of I-beams which are supported on the pile bents.

To Be Answered in June

1. *What are the advantages of the spot board in surfacing track? Can it be used for light surfacing? What are its limitations? What sequence should be followed and how should the jacks be placed when raising track with a spot board?*

2. *What precautions should be observed to protect highway and pedestrian traffic while making repairs to or renewing bridges across streets and highways?*

3. *What is the cause of chipping at the ends of rails? What can be done to eliminate or minimize this trouble?*

4. *To what extent is it practical or economical to salvage material and fittings when dismantling stations or other buildings for re-use in other structures?*

5. *What sequence should be followed and what measurements taken when installing main-line guard rails on tangents? On curves? Do these differ for the guard rail on the turnout side?*

6. *What measures, if any, can be employed to avoid undesirable settlement and probable distortion of line or grade of pipe culverts where the foundation material is unstable?*

7. *When filling a high trestle, what practical methods can be employed to eliminate or minimize the sliding of the embankment after the work is completed?*

8. *In what detail should pumpers be required to make reports of the operation of water stations? Of what value are such reports? How should they be used?*

We have used this scheme to support the ends of two 157-ft. spans, in one case maintaining the falsework for more than a year. In another instance, similar falsework was constructed with creosoted piling to support one end of a 204-ft. span and the end of an adjacent 220-ft. span. In this case, we expect to maintain the falsework for its full service life. In several other instances, we have followed this practice in connection with both deck and through plate girders, using untreated material to carry the structures until its service life had been obtained. In the latter case, the construction is simplified by placing the pile pier immediately in front of the masonry pier or abutment. We provide additional stiffeners over the bearing where necessary and place an additional support either on or immediately back of the old masonry to carry the short span which overhangs the pile piers.

As to the "why" of the matter: This was not done in the expectation that the ultimate expense would be reduced, but to defer the larger part of the total expense at a time when it is impossible to command the funds necessary to do in the usual way all of the work that must be done.

Follows This Plan as a General Practice

By C. P. DISNEY

Bridge Engineer, Canadian National, Toronto, Ont.

This question has received considerable attention on our road, and with practically no exceptions we are following the practice suggested, where it becomes necessary to renew or make extensive repairs to masonry substructures under traffic. We first prepare detail plans for the new abutment or pier and then complete plans in detail for the falsework, which is so designed as to permit the removal of the old structure and the completion of the new without alterations of the falsework as constructed.

In general, the falsework consists of pile or timber bents carrying a steel span over the abutment or pier. In many cases, where the masonry still has a considerable carrying capacity, we defer the installation of the steel span. In other words, we support the superstructure partly on the falsework and partly on the masonry, using the falsework to relieve the masonry of part of its load until the renewal becomes necessary.

In a large number of cases, however, the condition of the masonry is such that we cannot permit it to continue to carry any load and must, therefore, retire it from active service. Where this condition occurs, we place the steel span immediately. This involves the removal of some of the bracing in the superstructure and the cutting out of the backwall if the substructure in question is an abutment. Both of these operations are necessary to permit the erection of the temporary steel span.

Where the masonry has an appreciable load-carrying capacity, we do nothing after the timber portions of the falsework have been erected, except such routine maintenance as may be necessary to keep the supporting timbers adjusted to an even or solid bearing, until such time as the masonry deteriorates to the point where it becomes necessary to install the temporary steel span. After the steel span has been installed, whether at the time the falsework is driven or at a later date, the complete falsework assembly is left in place until it has completed its service life.

Our experience demonstrates that on the average we can expect a service life of 8 to 12 years from falsework constructed of untreated material. To do this, however, it is necessary to work out the design carefully in the first place and as carefully supervise the erection. All of our plans contemplate that the temporary structure will be erected in such a manner that slow orders will be unnecessary during the full period of its service life.

From the viewpoint of economics, we consider this to be good practice. By the time the ultimate service life of the falsework has been attained, the capitalized value of the cost of the masonry renewal has been saved. For example, if the replacement of the masonry substructure will cost, say, $30,000, and we are able to defer this expenditure for 12 years, we have saved an amount substantially equal to this cost. In other words, by following this practice we are able in effect to make the renewal at no cost.

This practice has been in vogue on the Central region of the Canadian National for the last 10 years. We have numerous structures on our fastest and heaviest-traffic main lines that have been cared for in the manner described. As a result of our experience in applying this plan, there remains in my mind no doubt that this is good railroading. While we have not compiled statistics to determine the exact sums that have been saved in this way, it is certain that such a compilation would disclose that the aggregate is very large.

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Tight Rail

Where rail is "tight," what practical measures can be taken to open up the expansion gaps ?

Rail Should Be Driven Back

By W. E. TILLETT

Assistant Foreman, Chesapeake & Ohio, Maysville, Ky.

The best method of adjusting tight rail is to cut 5 to 5½ in. from an occasional rail, preferably midway between the first and second bolt holes so that it will be necessary to drill only one new hole. The gap thus created must be closed by driving the rail in such a manner that the proper expansion gap will be obtained as far as this can be spread. By repeating this process at the proper intervals, all of the tight rail can be eliminated. As soon as the desired expansion has been obtained, anti-creepers should be applied to the rail in each section.

Closure Switch Point Is Effective

By C. W. BALDRIDGE

Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

If the rail is tight over a considerable distance, as a result of having been laid tight, the only practical remedy is to remove a rail at proper intervals and replace it with a shorter one. To distribute the gap thus provided, the joints can be loosened and the rails driven to proper spacing. Another method of distributing the opening made by the shorter rail is to open a joint, swing one rail outward and install a switch point, using a quick-closure clamp, as is done when laying rail; then remove the rail anchors for some distance back of the point. With the switch point in place but with the clamp slightly loose, allow a few trains to pass over the track. The creep of the rails will open expansion spaces at the joints of the unanchored rail. When sufficient openings have developed, the point and one rail can be removed and a rail of the correct length substituted.

Where the rails are too tight in short sections only, as

in sags, with corresponding excessive gaps in the adjacent track, the driving back process is probably best. If the stretches are long, however, the use of the switch point and utilization of the natural tendency of the rail to creep may be less expensive. It is best to close the excessive expansion by driving the rail, but this can be done by reversing the action of the switch point.

Takes Advantage of Natural Forces

By H. E. HERINGTON

Section Foreman, Minneapolis & St. Louis, Jordan, Minn.

Probably the most frequently used method of eliminating tight rail, particularly if there is a long stretch of it, is to substitute a rail that is 5 to 5½ in. short, depending on the bolt-hole spacing, and drive the rail to close this opening. If, on the other hand, there is only a short stretch of tight rail, with a corresponding stretch of open joints adjacent, it is often possible, by loosening the bolts slightly early in the morning, to obtain a complete correction of the trouble, for as the rail expands under the rising temperature the rail will drift toward the open joints.

Tight Rail Is Likely to Kink

By J. W. CUMBY

Section Foreman, Norfolk & Western, Blackstone, Va.

When rail is allowed to creep until it becomes tight, it is quite likely to buckle. For this reason, it often becomes a matter of urgent importance, particularly in the spring as hot weather approaches, that the expansion gaps be opened and the expansion distributed evenly. Usually where there is tight rail, there is an adjacent stretch with excessive expansion openings. If this happens, it is best to loosen the bolts on the latter stretch and close up the expansion by driving the rail. At the same time, to avoid wide-open gaps at any point, the tight rail should be driven so that the expansion in both sections will be put on an even footing. If the tight rail extends over too long a stretch to make this practicable, however, short rails should be introduced at convenient intervals and the expansion adjusted in short sections.

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Early Spring Surfacing

Is it possible to start surfacing track too early in the spring? Why? If so, what are the effects ?

Climatic Conditions Make a Difference

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Climatic conditions divide the answer to this question into two parts. In the South where the ground does not freeze, the only obstacle to early surfacing is wet weather. In fact, in some sections it is the regular practice to renew ties and surface track during the winter and early spring in order to get this work out of the way before hot weather and the competition of "cropping" interfere with these operations.

In northern sections where the ground freezes and the frost often strikes deep, it is possible to start surfacing too early. Obviously, general surfacing is impracticable so long as the ballast remains frozen. As soon as the frost has left the ballast, it is possible to surface track, but it is not good practice to do so. If surfacing is done before the frost is out of the roadbed and the roadbed is settled, the track will settle unevenly and the work must be done all over as soon as settlement is completed. Churning ballast and pumping ties almost invariably result from surfacing that is done before the roadbed is given an opportunity to settle and dry out.

Ground Should Be Well Settled

By C. S. ROBINSON

Engineer Maintenance of Way, Maine Central, Portland, Me.

Surfacing can be started too early in the spring, with consequent poor results for the track. If surfacing is attempted too early, especially in regions affected by hard freezing conditions, before the ground is well settled and free from excess moisture, the surfacing job will not stand up, especially at the joints. In track that is ballasted with bank-run gravel, or gravel of a similar character, surfacing that is done too early in the spring often sets up a condition which is expensive to correct, particularly if allowed to become accumulative.

Track Surfaced Too Early Does Not Hold

By HENRY BECKER

Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

It is possible to start surfacing track too early in the spring. Before this is attempted, the frost should all be out of the ground, the roadbed well settled and the roadbed and ballast dry. Frozen ground expands, but when it thaws, it returns to its original volume slowly, unless settled by spring rains. As the water from the rain is absorbed, the ground becomes wet and soft. If surfacing is started at any time before it has dried out, the ballast is quite likely to churn and pumping ties will be the eventual result. While all classes of ballast are affected, this is more noticeable in gravel and invariably occurs with dirty ballast of any kind. If the roadbed is dry and there is not enough rain to settle the ground after the frost leaves, track that is surfaced too early tends to become choppy as the slow settlement takes place.

Frost Must All Be Gone

By JOHN BEDNARZ

Section Foreman, Great Northern, Rugby, N. D.

To obtain good-riding track and minimize the effort necessary to secure it, surfacing should be deferred until the frost is all out and the ground well settled. This is particularly true where heaving has occurred. No greater mistake can be made than to do surfacing while the frost still remains in the ground. Settlement does not progress evenly, and track that is surfaced before or during the process of settlement will become badly out of surface by the time it is completed. This means double work and sometimes the unnecessary consumption of considerable ballast.

Roadbed Should Be Dry

By L. G. BYRD

Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

The proper time to start surfacing in the spring depends largely on the section of the country under consideration and the weather conditions that prevail. In climates where the rainfall is heavy in the spring, general surfacing out of face should be avoided until the rainy season is over and the roadbed has had an opportunity to dry out. When surfacing is done during or

immediately in advance of a long-continued rain, the track becomes soft and quickly out of surface. This is particularly aggravated in dirty ballast or ballast that contains a large percentage of fine material. Where the ballast is clean broken stone, it is usually more economical to do the out-of-face surfacing in connection with the tie renewals, especially if the renewals are heavy.

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Cleaning Cut Ditches

To what extent should the section forces clean and shape side ditches through cuts in the spring? Should this be done as a special job or in connection with other work **?**

Hand Ditching a Thing of the Past

By A. H. REETZ

Supervisor of Track, Minneapolis & St. Louis, Hampton, Iowa

Almost invariably the necessity for ditching in the spring by the section forces is the result of failure to have the ditches in good condition in the fall. Obviously, however, slides may occur which must be removed, at least in part, to permit a free flow of the water, but this is not a major problem on most sections.

Hand ditching is a thing of the past. It is expensive, slow and unsatisfactory in every respect, as compared with the spreader-ditcher or other ditching equipment. Hand ditching in the spring is especially difficult because the ground is wet and often sloppy. A good ditch can be made with the spreader whether the cut is wet or dry and this machine should be used even on small jobs.

There are some cases where hand ditching must be done to get rid of water in the cut and prevent soft track. It is often practicable to use a local freight train to do small jobs of ditching that require only two or three hours. If the cuts have been properly cared for with ditching equipment, they can usually be cleaned out in a short time. In the main, however, hand ditching should be avoided and done only so far as necessary to keep a clear channel.

Ditching Is Vital to Good Track

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Water is the worst enemy of the roadbed and the value of clean ditches is so great that they are often a vital matter to the foreman who wishes to maintain good track. Neglected ditches are usually eyesores, but more than this, they may result in losses of considerable magnitude by reason of fouled ballast and the extra but unproductive labor that is required to maintain smooth track. Not infrequently, soft spots in the roadbed get their start from neglected ditches.

This brings us to the question. The answer is that despite the importance of keeping ditches clean, the heavy work of ditching should not be thrown onto the section forces. Hand labor in ditching is too wasteful, particularly as every railway has or should have mechanical equipment for this purpose. It has often been said that the best time to do winter work is in the summer and fall. This applies equally well to ditching in the spring. If the ditches have been properly cared for in the fall, in most cases, the spring ditching will require only a minor amount of work.

It is likely that some places will be obstructed and the channel should be kept open to allow a free flow of water. If the slopes are not sodded and there is considerable erosion from either water or frost, more work will be required. In any event, drainage is of so much importance that the necessary time should be given to it.

In general, spring ditching should never be done in connection with other work. It should be completed well in advance of surfacing and tie renewals to give the roadbed an opportunity to dry out and settle before track work of this character is started. Later, the ditching equipment can be used to shape the ditches and remove any surplus material that may be present.

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Clogged Well Screens

Where a well screen becomes clogged with sand, what measures, if any, can be employed to overcome the trouble **?**

There Are Two Causes for This Trouble

By R. N. FOSTER

Water Engineer, Wabash, Decatur, Ill.

A well screen may become clogged as a result of sand packing into the slots on the outside or the sand may enter the screen and settle to the bottom, eventually closing off a large part of the screen.

In the first case, considerable benefit can often be obtained by merely flushing the well with water from the storage tank. The rate of back flow should be as high as practicable and should be intermittent to produce a churning effect. If this procedure does not produce the desired results, another method can be used where the proper facilities are available. To apply this method, it is necessary to pull the pump (or the suction pipe) and cap the well, leaving an opening for the discharge from a pressure pump. Then, drawing water from the storage tank, it should be pumped into the well under pressure until the sand lets go. As soon as this occurs, the pressure on the pump will drop to zero. We have used this method with marked success, and since the cost is trivial, it can be repeated annually or as often as may be necessary.

In the second case, where the sand has settled on the inside of the screen, agitation is required to get this sand into suspension, to make it possible to pump it out. This can be done by extending the drop pipe to a point near the bottom of the screen. An inexpensive air lift can often be used to remove this sand, and this method is advisable since the drop pipe can be raised or lowered at will, thus serving to keep the sand in suspension and in this way making it possible to remove practically all of it.

Obviously, these methods are not designed to correct conditions where screens have become clogged by reason of incrustation or corrosion. These are entirely different matters which must be treated in a different way.

Always a Source of Annoyance

By Supervisor of Water Service

Sand-clogged well screens may or may not be a serious matter; they are always a source of considerable annoyance. If the screen is in a stratum of fine sand which packs tightly, the production of the well may be reduced or shut off entirely. In this event, the trouble may be nearly constant. Temporary relief can usually be obtained, however, by means of back flow through the screen with sufficient velocity to agitate and drive the sand away or loosen it for the time being.

If the difficulty persists and the production is seriously curtailed, it may be necessary to construct a gravel-wall well, of which there are several types, and abandon the existing well. In not a few cases where sand gives trouble, air-lift pumping will give more satisfactory results, even where gravel-wall wells have been constructed, although this method is not adapted for shallow wells.

If the trouble is caused by sand wedging in the slots of the screen, back flow from the service tank will often dislodge it and correct the trouble for a long time. If practicable to do so, the production of a surge in the back wash may aid in loosening the sand in the slots. If the sand is so tightly wedged that this does not loosen it, it may be necessary to pull the deep-well pump, cap the well and apply pump pressure to blow the sand out. An operator should stand by to shut the pump down when it begins to race with the drop in pressure as the sand lets go.

Fine sand sometimes passes through a screen in sufficient quantities to fill or partly fill the interior of the screen and thus reduce the flow. Some means of agitation is necessary to loosen this sand and get it to moving with the current. In this case, the air lift provides the best means of removing the deposit. This may be a permanent installation if the quantity of sand is sufficient to cut the cylinders and valves or the impellers of the pumps. If a smaller quantity is involved, which must be removed at infrequent intervals, a portable outfit may be preferred.

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Downspouts

What is the minimum size of downspouts that should be permitted on station buildings? Why ?

Uses a Minimum of 3 In.

By J. W. ORROCK

Engineer of Buildings, Canadian Pacific, Montreal, Que.

It has been our general practice to use a minimum diameter of 3 in. or its equivalent for downspouts on station buildings. This is done because it is considered that any smaller size will cause constant trouble with choking as a result of the accumulation of rubbish and silt which always washes from the roof surfaces and gutters. The whole question of roof leaders depends upon numerous factors, among which are the location and type of building, the maximum rate of rainfall per hour, the area and pitch of the roof, etc.

On flat-roofed buildings, the leaders are generally placed on the inside of the structure in galvanized or cast-iron pipe. If the roof is sloping, the leaders are usually carried on the outside and are of copper or galvanized sheet iron. Outside leaders in localities subject to low temperatures are preferably made of corrugated, oblong or square cross sections to prevent them from bursting when frozen.

We have experimented with the use of a steam jet inserted at the base of the downspout to overcome the tendency to freeze. It has been found, however, that while this method will keep the downspout free of ice, it is quite costly with respect to steam consumption. It is also open to the further objection that it depends upon manual operation, which is not always reliable.

In towns where there are separate storm-water sewers, it is not customary to trap the connections between the downspout and the sewer. On the other hand, where both storm water and sanitary sewage are carried in one system, it is the practice to trap these connections for each downspout.

It is our general practice to use downspouts ranging from 3 to 6 in. in diameter, depending on the factors already mentioned. An empirical rule used in selecting the size for downspouts is to allow 1 sq. in. of sectional area of downspout for from 70 to 250 sq. ft. of projected roof area, depending on the slope of the roof and the amount of rainfall that can be expected at this location.

In the Recommended Minimum Requirements for Plumbing, issued by the United States Department of Commerce, the following sizes are suggested for inside downspouts:

Area of roof square feet	Diameter of Downspout Inches
0 to 90	1½
91 to 270	2
271 to 1,800	3
1,801 to 3,600	4
3,601 to 5,500	5
5,501 to 9,600	6

For outside downspouts, the next larger size than that given in the table is recommended. For the reasons already given, however, it is our practice to make 3 in. the minimum size to be used on any station building.

Should Have a Minimum Diameter of 5 In.

By A. L. BECKER

Architect, Gulf Coast Lines, Houston, Tex.

Downspouts less than 5 in. in diameter should not be permitted on station buildings. The usual practice in calculating the size of downspouts is to provide 1 sq. in. of downspout area for each square (100 sq. ft.) of roof area draining into the downspout. A diameter of 5 in. provides an area of 19.63 sq. in. which is considerably in excess of the area that will be drained into one downspout from the roof of an ordinary station building.

For the United States as a whole, the average maximum intensity of rainfall is 8 in. an hour. In the Gulf Coast territory, this intensity is often exceeded in the torrential rains that fall occasionally. Five-inch downspouts are more difficult to stop up than the smaller sizes. Difficulty has been experienced in this territory with trash and leaves which fall into the gutters and with small bird's nests which are built in them. These are carried into the downspouts, causing them to stop up, and as a result a diameter of less than 5 in. causes almost unlimited trouble.

Small Leaders a Constant Source of Trouble

By Supervisor of Bridges and Buildings

Probably no single item in the routine work of the building forces is so aggravating as choked downspouts. In addition, not infrequently they are the cause of considerable damage to the buildings to which they are attached. Regardless of the size of the leaders, however, it is not always practicable to overcome the difficulty in its entirety. On the other hand, small leaders are a constant source of trouble, much of which could be avoided by the use of downspouts of larger size.

Most designers base their selection of the size of the downspouts they use on the rainfall records and the slope and area of the section of the roof to be drained. While these factors are important and should not be ignored, there are often others of equal importance which should be given consideration. These include the probable rate of deposit of front-end screenings on the roof

and in the gutters, the amount of snowfall and the length of the period of freezing and thawing during the late winter or early spring.

A station located among or near trees is likely to have its downspouts choked with leaves and other trash. One that is located on a pusher grade or near the throat of a yard will accumulate a deposit of front-end screenings in a short time, much of which will find its way into the downspouts. Likewise, snow on a roof sends a constant trickle of ice-cold water into the downspouts during periods of alternate freezing and thawing, which accumulates on the interior surface as ice.

Downspouts of any size may become choked with leaves, but they should be large enough to eliminate the trouble with cleaning which is often experienced with those of small diameter. Large pipes pass the screenings more freely and give more space for the accumulation of ice without being completely obstructed. For these reasons, I would make the minimum diameter 5 in. and would increase this to 8 in. if occasion requires, regardless of the size indicated by rainfall and roof area.

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Prevention of Heaving

When removing foul ballast and clay from a heaved spot, how far each way and how deep should this be done? What material is most suitable for backfilling to prevent future heaving ?

Drainage Will Be of Considerable Help

By C. E. TALLENT
Section Foreman, Texas & Pacific, Wilkins, Tex.

In sections where the rainfall is light, good results can often be obtained by removing all the foul ballast and cutting transverse ditches at the centers and joints. They should be excavated well below the water pocket which has caused the heaving and refilled with fresh stone, at the same time replacing the dirty ballast with clean material. If the track is in a low country or a wet cut, it will also be necessary to construct a parallel ditch to the proper depth and fill it with coarse stone. Little improvement can be expected without adequate drainage.

Remove All Bad Material

By H. T. LIVINGSTON
Division Engineer, Chicago, Rock Island & Pacific, Little Rock, Ark.

It is impracticable to specify a definite distance each way from a heaved spot, from which foul ballast and clay should be removed. Both the ballast and the clay should be removed, however, for the entire distance over which the heaving occurs. If the condition which is causing the trouble extends into the roadbed, the roadbed itself should be removed, making sure that the pocket of wet or moving material is excavated.

A variety of causes may be responsible for the condition, but, in general, it arises from either poor drainage or poor material, or both. In the removal of the old material, the walls of the excavation should be vertical; suitable material should be used for backfilling; and this should be tamped thoroughly as the filling progresses, care being taken during the operation to insure good drainage. After the portion involving the roadbed proper has been completed to the same elevation as the top of the hole, new clean ballast should be placed on the repaired roadbed, tamped and dressed to insure proper drainage.

The foregoing discussion is intended to cover the treatment where relatively small areas are affected. Where long stretches of track rest on poor soil and the condition is chronic, it is well to work to a definite program looking to the removal of all of the roadbed affected and replacement with suitable earth. Such a program involves expenditures, however, that do not properly fall within the ordinary maintenance expected from the normal section forces.

Should Get Below Frost Line

By JOHN BEDNARZ
Section Foreman, Great Northern, Rugby, N. D.

Every particle of the foul ballast and saturated clay should be removed from the area that has heaved. To insure that this is done, the excavation should extend the full length of the heave for a width of 4 to 5 ft., to a point well below the frost line, which in this country lies 7 to 8 ft. below the surface. The backfilling should consist of cinders, gravel, broken stone or other suitable porous material.

Should Go to Bottom of Water Pocket

By W. E. TILLETT
Assistant Foreman, Chesapeake & Ohio, Maysville, Ky.

Wet spots and water pockets in the roadbed, which are sources of heaving, increase the work of maintenance, aside from the trouble they give as a result of heaving track. The most effective remedy is to remove the clay and foul ballast from the full length of the spot which has heaved, to a width of 5 to 8 ft. and to whatever depth may be necessary to get below the water pocket or saturated clay. The hole thus formed should be filled with loose stone and boulders up to about 1 ft. below subgrade and brought to subgrade with locomotive cinders. Clean ballast should then be substituted for the dirty ballast that has been removed.

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Treating Second-Hand Lumber

Under what conditions is it economical to give preservative treatment to second-hand bridge timbers ?

Thinks Treatment Does Not Pay

By L. G. BYRD
Bridge and Building Supervisor, Missouri Pacific, Wynn, Ark.

It has been my practice to use second-hand bridge material in the repair of other untreated structures where this can be done to advantage. In other words, we make use of second-hand stringers, caps, ties, sway braces and piling to repair structures of the same type as those from which the material was released, provided this can be done economically. In this way the repair material will often last long enough to develop the full service life of the structure as a whole.

In general, the cost of sawing second-hand timbers to obtain the sound portions that are suitable for treatment, is too great to justify the practice. A large percentage of the timber that is released from trestles that are undergoing repairs is not suitable for re-use in similar structures, even those that are near the end of their service life. It is usually practicable, however, to cut it

up into smaller pieces and use it in repairing buildings, platforms, stock pens, etc., and obtain a service life equal to that of the material remaining in these structures.

While I have not made a careful analysis of the relative ultimate cost of using second-hand bridge timbers untreated as compared with treating them and, therefore, have no figures to back me up, I base my opinion on long experience in bridge work, that the treatment of second-hand timber does not pay, except possibly in a few special cases.

This Subject Wants Careful Study

By District Engineer

Considered as a general proposition, there is little economy to be derived from the treatment of second-hand bridge timbers. There are special cases, however, where there is a real advantage in doing so. In any given case, the cost of preparing, shipping and treating should be compared with the cost of new timber treated. If this is in favor of the second-hand material, the difference should be weighed carefully with the advantage of having this material available for making repairs to structures similar to those from which it was removed or for the many other purposes for which untreated material is ordinarily used.

Obviously, there is no profit, but a real loss in treating decayed wood. To prepare the timbers for treatment, it is necessary, therefore, to cut them so that only sound wood will be treated. Where stringers, caps or sills are decayed at the top or bottom, the slab of decayed wood must be ripped off, the cost usually being prohibitive whether done at the mill or by hand. Much sound second-hand timber is usually salvaged during a season, however, and this can often be to advantage and used for mudsills, bulkheads, platforms and even for small bridges in farm crossings. In these applications, the treatment of second-hand bridge timbers often demonstrates economy. For general purposes, however, the matter should be studied carefully before making a decision.

Can Carry the Practice Too Far

By H. R. DUNCAN

Superintendent of Timber Preservation, Chicago, Burlington & Quincy, Galesburg, Ill.

In the interest of economy or to provide low-cost construction, estimators and designers not infrequently plan to use second-hand bridge material for a wide variety of purposes. This practice has doubtless saved large sums in construction costs, while it has made it possible to use to real advantage timber that otherwise might have been used for firewood. Frequently, second-hand timbers have been used in applications for which treated wood has been desirable. This has led to the practice of treating some second-hand bridge material. It is very easy, however, to carry the practice to such extremes that an investigation will disclose many cases where it was not economical to treat the timber. On the other hand, if done with judgment and under proper supervision, there are many other cases where real economy can be demonstrated.

If there is sufficient demand for second-hand material for applications for which treatment is not desirable, it is doubtless better to use only new material for those purposes where treatment is necessary. If the supply of second-hand timber exceeds the demand, however, consideration should be given to the preservative treatment of as much of it as can be used economically, but before treatment is given it should be inspected carefully, since nothing but sound wood should be treated. If a stick has a small amount of decay present, it may be possible to resaw it or to cut off the decayed part and treat the sound wood remaining. It is not economical to treat wood in which decay is present, or even suspicion of decay.

Not infrequently, temporary bridges or falsework are constructed of untreated timbers, which are released after a few months of service. It is my thought that such timbers, as well as other sound second-hand material, can be treated satisfactorily and used to construct bulkheads at the ends of trestles, as cribbing, for retaining walls, as mudsills or permanent blocking, to support small buildings which do not justify permanent foundations and for many other purposes which require the timber to be in contact with the soil. It can be used as posts or sills for loading and unloading platforms or to construct the low bridges which are often necessary in farm crossings. In nearly all of these applications, the use of second-hand treated timber may demonstrate economy. If it is intended for general purposes, however, the matter should be studied carefully before making a decision.

The Timber Must Be Sound

By L. L. HARPER

Superintendent Creosoting Plant, Central of Georgia, Macon, Ga.

It is not economical to treat second-hand timbers unless they are sound. To treat decaying timber is only to waste the preservative. If the timber is sound, it can often be treated and used to advantage for repair work on branch lines and at terminals. Where it is proposed to do this, it is best to make a saw cut at each end of the stick to determine the condition of the timber. In the case of stringers, it is often necessary to cut off about 12 in. at each end to get into sound wood. Obviously, this makes them unsuitable for reuse in trestles of the same bent spacing; but they can often be used in special cases or as stringers for overhead highway bridges. Shorter sections of stringers can often be reworked into ties for steel bridges.

If braces are of sufficient length, they can be treated and used again for the same purpose, provided split ends are cut off. If this shortens them too much, they can sometimes be used untreated for crossing plank at unimportant highways. Because of their special exposure to weather and damage from spiking, ties are seldom worth treating.

Second-hand piles, sawed at or above the ground line, can be used as splices or posts in other trestles, or as posts for platforms. The cost of preparing and framing them will usually determine whether they can be used to advantage.

In rare instances, in cases of abandonment, it may be possible to re-use at some other location practically all of the timbers from a trestle which has been built for only a short time. In dismantling the structure, some of the timbers are likely to suffer damage through handling, pulling bolts, abrasion, etc. To protect these points as well as to improve the general resistance of the timber to weathering, it may be advisable to give it a light treatment before it is re-used. Occasionally, piles which have been used in falsework can be reclaimed and treated for further use. If it is pine, the bark and skin should be removed at the time of original driving to prevent borers from getting into the wood.

I would not recommend the standard retention when treating second-hand timbers. A lighter treatment will, in most cases, protect the end cuts, the bolt holes and abrasions sufficiently to insure getting the full remaining benefit from the timber without adding too much expense.

News of the Month • • •

Loss and Damage Payments Drop in 1932

Loss and damage payments by the Class I carriers of the United States, as reported to the Freight Claim division of the American Railway Association, totaled $18,936,024 in 1932, as compared with $25,868,485 in 1931, a decrease of $6,932,461, or 26.8 per cent. Decreases from 1931 occurred in all of the causes, ranging from 51 per cent in concealed loss to 3 per cent in robbery other than entire package.

I. C. C. Gets $7,137,639 for 1934

The amount of the Interstate Commerce Commission appropriation for the fiscal year 1934 has been fixed at $7,137,639, both houses of Congress having passed the independent offices appropriation bill providing for this amount. This appropriation is only $10,921 less than was provided for the present year, but it is a reduction of approximately $2,000,000, as compared with the appropriation for 1932.

Reorganization Bill Passed by Congress

Railroad reorganizations under the control of the Interstate Commerce Commission as a substitute for receivership procedure are provided for in a bill, known as the Hastings bankruptcy bill, which was passed by Congress during March. The bill provides for financial reorganization without receivership for companies that are insolvent or unable to pay their indebtedness. It specifies that the property shall be placed in the hands of a trustee, to be chosen by the courts from a panel selected by the commission, pending the working out of a reorganization plan in proceedings before the commission.

Train Exhibits at World's Fair

A train made up of cars taken from trains operated by the Chicago, Burlington & Quincy, the Great Northern, the Northern Pacific, the Colorado & Southern and the Spokane, Portland & Seattle will be exhibited alongside the Royal Scot of the London, Midland & Scottish of Great Britain, at the Century of Progress Exposition which opens in Chicago on June 1. The first car of the American train, provided by the Burlington, will be a U. S. railway postoffice manned by a crew of postal clerks. Next will be a chair car of the type carried on the Burlington's Chicago-Denver train, "The Aristocrat," and demonstrating the latest style of adjustable chairs. The third car will be a dining car similar to that used on the "Black Hawk" operating between Chicago and the Twin Cities. Next will be two Pullman cars featuring different types of accommodations and illustrating the equipment carried on the "North Coast Limited" and "The Empire Builder" between Chicago and Portland, Ore. The last unit will be a solarium lounge car with appointments suggestive of a town club.

Net Deficit of Class I Carriers in 1932 Was 153 Million

For 1932 the 162 Class I railways of the United States had a net deficit of $153,308,487, after the payment of fixed charges, as compared with a net income of $116,362,840 for 1931, according to the Interstate Commerce Commission's monthly compilation of selected income and balance-sheet items. The net railway operating income of these railroads for the year was $336,112,509 and other income amounted to $210,143,966 while interest and other deductions amounted to $699,564,962. One hundred and sixteen Class I roads, representing about 75 per cent of the mileage, had net deficits for the year after the payment of fixed charges, while 57 had operating deficits.

New Cincinnati Passenger Terminal Opened Prematurely

Driven out of the old Central Union Terminal, Cincinnati, Ohio, by flood waters of the Ohio river, the railways using that terminal moved into the new Union Station suddenly on Sunday, March 19, two weeks ahead of the scheduled date for its opening. Although many details were unfinished, all facilities were rushed into service and traffic was handled with little inconvenience or interruption. At the crest of the flood, the waiting room floor and station tracks of the old Central Union Terminal were under five feet of water, while the Pennsylvania-Louisville & Nashville station was maintained in service throughout the flood although its abandonment was considered. The new terminal will be formally opened on the morning of April 1.

I. C. C. Extends Freight Surcharge Another Six Months

The emergency freight surcharge which has been in effect since January 4, 1932, will be continued for an additional period of six months, according to a decision which the Interstate Commerce Commission made public on March 13. The commission, however, expressed the opinion that the surcharge, as such, should be brought to an end, but that a reasonable period should be allowed during which the railroads will have an opportunity to file tariffs in the usual way proposing such readjustments in their rates, in the light of the impending discontinuance of the surcharge, as they feel they can justify. The commission cites figures showing that in 1932 receipts from the surcharges amounted to $63,730,797, which amounted to 2.6 per cent of the freight revenue and 19.1 per cent of the net railway operating income.

Merger of Transport Bodies Under Consideration

Following the enactment of legislation giving President Roosevelt the power to reorganize, combine or abolish functions of organizations in the executive branch of the government, reports have been current to the effect that the administration's plans for reorganizing government agencies includes a scheme for placing the regulation of all forms of transportation under a new organization to be headed by a director of transportation. The functions of this organization would include those now embodied in the Interstate Commerce Commission, the Shipping Board and the Aeronautics Branch of the Department of Commerce, as well as any jurisdiction over highway transportation that might be provided for by new legislation.

Citizens Transportation League Shows Growth

The Citizens Transportation League, which was organized at St. Paul, Minn., on November 1, 1932, to promote a co-ordinated state and nation-wide drive to reduce taxes, make highways safer and to maintain orderly, efficient transportation at the lowest possible rates, has developed into an organization of 212,000 voters in Minnesota and 40,000 in North Dakota. At the same time the activities of the league are being extended into Montana and Washington. The political significance of the league is demonstrated by the fact that the largest vote ever cast in St. Paul was about 100,000 and that 55,000 of these voters have pledged their support in writing to the league's program. In Minneapolis, 75,000 pledges have been obtained, which number is also about half of the active voters.

Gen. Atterbury Presents Views on Depression

Testifying recently before the Senate finance committee during hearings on the causes of and remedies for the depression, Gen. W. W. Atterbury, president of the Pennsylvania, said that there is "no panacea for a resumption of prosperity except the slow painful one of hitting the bottom and then slowly building up with a sane and economical foundation on which to build." In discussing the transportation situation, Gen. Atterbury said that our system of national and state regulation of transportation should be restored to its original purpose which was to secure just and reasonable charges for transportation and to prevent the use of special rates and rebates. He prophesied that much branch line mileage will be abandoned and that the truck and bus will find their useful places, as will also aviation.

Association News

Maintenance of Way Club of Chicago

V. R. Walling, principal assistant engineer, Chicago & Western Indiana, addressed 60 members and guests on Highway Crossings on March 22. His paper will be presented in a later issue. The next meeting of the club will be held on April 19, at which time officers for the ensuing year will be elected. This will be the last meeting until fall.

Wood Preservers Association

Seven members of the Executive committee met informally at Chicago on March 15. Dr. A. L. Kammerer was appointed temporary chairman of the Preservatives committee to succeed W. H. Fulweiler and to serve until a permanent chairman can be selected at a spring meeting of the Executive committee which it is proposed to hold jointly with the Committee on Wood Preservation of the A. R. E. A. at the new Forest Products Laboratory, Madison, Wis., in June.

Railway Tie Association

President Watkins has appointed H. H. Van Metre (Joyce-Watkins Company), E. E. Pershall (T. J. Moss Tie Company) and D. C. Jones (Ayer & Lord Tie Company) as members of a committee to co-operate with A. R. Fathman, chairman, whose appointment was announced in the February issue, to report on Utilizing Ties in Grade Proportions Normal to Woods Run Production and Standardizing Tie Lengths. This committee, with others, will report at the fifteenth annual convention of this association which is to be held at Richmond, Va., on May 10-11.

Bridge and Building Association

Approximately 40 members of this organization and of the Supply Men's Association met for luncheon in Chicago on March 14, during the convention of the A. R. E. A. Following the luncheon, members of the Executive Committee met to consider the possibility of holding an abbreviated convention this fall. It was decided to forego the regular convention for another year and in lieu thereof to hold a meeting of the Executive committee in Chicago on Tuesday, August 29.

American Railway Engineering Association

At a meeting of the board of direction immediately after the close of the convention on March 15, it was decided to hold the Thirty-fifth convention on March 13, 14 and 15, 1934, although definite decision as to whether to hold a three-day convention extending over onto March 15 was deferred until a later date.

A large number of changes have been made in the personnel of the committees, including the selection of members for a new committee on Economics of Railway Bridges and Trestles, of which Arthur Ridgway, chief engineer of the D. & R. G. W. and chairman of the Committee on Wooden Bridges and Trestles, has been made chairman. Other members of this committee are: F. H. Cramer, assistant bridge engineer, C. B. & Q., and R. P. Hart, assistant engineer, M. P., representing the Committee on Wooden Bridges and Trestles; A. C. Irwin, Portland Cement Association and A. N. Laird, bridge engineer, G. T. W., representing the Committee on Masonry; H. S. Loeffler, engineer of bridges, G. N., and F. J. Pitcher, engineer of structures, N. Y. N. H. & H., representing the Committee on Iron and Steel Structures; C. C. Cook, maintenance engineer B. & O., and F. C. Shepherd, consulting engineer, B. & M., representing the Committee on Wood Preservation.

Thus far only one change has been made in the chairmanships of the standing committees, Lem Adams, chief engineer, Union Pacific, having been appointed chairman of the Committee on Economics of Railway Labor to fill the vacancy caused by the resignation of F. M. Thomson, district engineer, M-K-T.

Metropolitan Track Supervisors' Club

The next meeting of the Metropolitan Track Supervisors' Club will be held at Keen's Chop House, 72 West Thirty-Sixth street, New York, on Tuesday, April 25, at 3 p. m., and will be followed by an informal dinner at 6 p. m. The principal speaker at the meeting will be George M. Cooper, Ramapo Ajax Corporation, who will discuss the development in the design of frogs and switches.

January Net Shows Increase Over Previous Year

The net railway operating income of the Class I railroads in January amounted to $13,265,721, as compared with $11,182,051 in January, 1932. Operating revenues for the month amounted to $226,555,138, as compared with $272,115,638 in the same month of the previous year, a reduction of 16.7 per cent, while operating expenses were $181,679,761, as compared with $227,032,393, a reduction of 20 per cent.

A Work Train on the Louisville & Nashville

Personal Mention

General

R. H. Aishton, president of the American Railway Association, whose railway experience included many years in the engineering department of the Chicago & North Western, has been elected chairman of the board of directors of the A. R. A., and has been succeeded as president by **M. J. Gormley,** heretofore executive vice-president. Mr. Aishton was born on June 2, 1860, at Evanston, Ill., and entered railway service in 1878 as an axman in the engineering corps of the North Western, serving successively as a rodman, levelman, assistant engineer, superintendent of bridges and

R. H. Aishton

buildings, and division engineer until 1895. In that year he was transferred to the operating department as assistant superintendent, being advanced to division superintendent two years later. Mr. Aishton was promoted successively to general superintendent, assistant general manager, general manager, and in 1910 to vice-president in charge of operation and maintenance. In 1916, he was elected president of the North Western. During the war he was made regional director of the Northwestern region of the United States Railroad administration. Mr. Aishton was elected president of the American Railway Association in 1920.

Frank L. Burckhalter, general manager of the Southern Pacific, Pacific System, and formerly a district engineer on this road, has been elected vice-president of the Southern Pacific Company, with headquarters as before at San Francisco, Cal. **Armand T. Mercier,** vice-president and general manager of the Pacific Electric (a subsidiary of the Southern Pacific), and formerly a division engineer on the Southern Pacific, has been appointed general manager at San Francisco to succeed Mr. Burckhalter.

Mr. Burckhalter was born at Truckee, Cal., in 1879, and graduated from the University of California in 1900. Shortly thereafter he entered railway service

as a rodman in the engineering department of the Southern Pacific being promoted successively to assistant engineer, construction foreman and roadmaster.

Frank L. Burckhalter

From March, 1906, to November, 1911, he served as division engineer at Bakersfield, Cal., and at Los Angeles, then being promoted to district engineer at Portland, Ore. On March 1, 1914, Mr. Burckhalter was transferred to the operating department as superintendent of the Portland division, with headquarters at Portland, Ore. He was promoted to assistant general manager, with headquarters at San Francisco, on Septembeer 1, 1918, and on January 1, 1929, to general man-

Armand T. Mercier

ager of the Pacific Lines of the Southern Pacific.

Mr. Mercier has been connected with the Southern Pacific and its subsidiaries, the San Diego & Arizona and the Pacific Electric, for 29 years. He was born on December 11, 1881, at New Orleans, La., and graduated from Tulane University, in 1903. He entered railway service in January, 1904, as a transitman and clerk to a roadmaster on the Southern Pacific at Los Angeles. During the following 13 years Mr. Mercier was advanced successively through the positions of assistant gang foreman at Los Angeles, assistant engineer in charge of reconstruction work on the Colorado river, general foreman and engineer of bridges and buildings in charge of steel bridge construction, engineer and general foreman in charge of terminal construction work at San Pedro, Cal., and Los Angeles, assistant division engineer of the Los Angeles division, assistant district engineer of the Southern district, and division engineer of the San Joaquin and the Los Angeles divisions. In February, 1917, he was appointed assistant superintendent of the Shasta division at Dunsmuir, Cal., then being promoted to superintendent of the Portland division in September, 1918. In November, 1921, he became general manager of the San Diego & Airzona, with headquarters at San Diego, Cal., and in April, 1927, he was elected also president of that road. On July 3, 1929, he was elected vice-president and general manager of the Pacific Electric.

Engineering

W. W. Marshall, roadmaster on the Missouri-Kansas-Texas, with headquarters at Boonville, Mo., and formerly district engineer at the same point, has been appointed district engineer, with headquarters at Parsons, Kan., to replace **F. M. Thomson,** who has resigned.

M. H. Brown, Jr., division engineer of the Idaho division of the Oregon Short Line, with headquarters at Pocatello, Idaho, has had his jurisdiction extended to include the Utah division, and now has supervision over all the lines of this company. The position of division engineer of the Utah division, which has been held by **E. E. Moberly,** with headquarters also at Pocatello, has been abolished.

H. I. Hoag, assistant engineer in the office of the chief engineer maintenance of way of the New York Central, with headquarters at New York, and formerly division engineer on the Syracuse division at Rochester, N. Y., has been appointed division engineer of the Pennsylvania division, at Jersey Shore, Pa., succeeding **Samuel A. Seely,** deceased. **C. H. Morse,** general track inspector, with headquarters at New York, has been appointed assistant engineer to the engineer maintenance of way, succeeding Mr. Hoag.

Mr. Morse, who was born on September 14, 1885, at Brandon, Vt., received his higher education at Columbia University, and began his railroad career as a clerk in the operating department of the New York Central at Watertown, N. Y. On September 10, 1907, he was appointed a chainman, and after holding successively the positions of rodman and transitman, he was appointed assistant supervisor at Hudson, N. Y., on June 20, 1912. On October 1, 1913, he was transferred to Poughkeepsie, N. Y., and on May 1, 1915, was made general foreman at Corning, N. Y. Mr. Morse was appointed supervisor of track at Clearfield, Pa., on September 1, 1920, and on April 16, 1929, was promoted to general track inspector, with headquarters at New York, the position he was holding at the time of his recent promotion to assistant engineer.

James E. Beatty, who has been appointed engineer maintenance of way of the Eastern Lines of the Canadian Pacific, as noted in the March issue, has been in railroad service in Canada and Alaska for nearly 36 years. He was born on June 6, 1872, at Parry Sound, Ont., and received his education at the Royal Military College. He entered railway service in 1897 with the Canadian Pacific but left this company a year later to go with the White Pass & Yukon, serving with this company and the Klondike Mines Railway until April, 1904, when he returned to the Canadian Pacific as a transitman at London, Ont. In August of the same year Mr. Beatty went with the Guelph & Goderich (part of the Canadian Pacific) as a resident engineer on construction and in October, 1908, he was appointed assistant engineer on the Canadian Pacific at Schreiber, Ont., being made a resident engineer at the same point in May, 1910. In February of the following year he was appointed assistant engineer of construction on the Eastern Lines and in August, 1913, he was made division engineer on construction, with headquarters at Montreal, Que. In 1915 Mr. Beatty was promoted to district engineer at St. John, N. B., later being transferred to the general superintendent's office at Montreal. In January, 1916, he was appointed district engineer of the Quebec district, at Montreal, which position he held until his recent appointment.

Daniel Hillman, who has been appointed district engineer of the Quebec district of the Canadian Pacific, with headquarters at Montreal, Que., as noted in the March issue, was born at Bothwell, Ont., on November 6, 1877. He entered railroad service in October, 1901, with the Canadian Pacific and served successively as chainman, rodman, topographer, levelman and transitman. From 1905 to

Daniel Hillman

1912, Mr. Hillman served as assistant engineer and in 1913 he was appointed division engineer on location and construction in eastern Canada. After military service in the World War from 1915 to 1919, Mr. Hillman returned to the Canadian Pacific in December of the latter year as district engineer of construction, and in 1923 he became engineer of construction with headquarters at Montreal, the position he held until his recent appointment as district engineer.

M. H. Doughty, division engineer on the Delaware, Lackawanna & Western, with headquarters at Hoboken, N. J., has been appointed to the newly-created position of engineer maintenance of way, with the same headquarters, this change having been brought about by the death of **A. J. Neafie,** principal assistant engineer, whose death was noted in the March issue. The position of principal assistant engineer, which carried with it jurisdiction over all matters pertaining to the maintenance of roadway and track, has been abolished. In a reorganization of territories in connection with the above change, **D. R. Young,** division engineer, with headquarters at Buffalo, N. Y., has had his territory extended to include all lines in New York state, and **L. L. Tallyn,** division engineer at Scranton, Pa., has been transferred to Hoboken, N. J., and given jurisdiction over all territory in Pennsylvania and New Jersey. **R. L. Sherwin,** assistant engineer, at Hoboken, has been appointed assistant division engineer, with headquarters at Scranton, and the position of division engineer at that point has been abolished.

Mr. Doughty, who was born on September 3, 1877, at Maxville Prairie, Wis., received his higher education in the State College of South Dakota, from which he was graduated in 1900. During 1901 and the early part of 1902, he continued his

M. H. Doughty

studies in civil engineering at the University of Minnesota and then, on March 1 of the latter year, he entered the service of the Lackawanna as a transitman. From 1902 to 1909, Mr. Doughty held various positions in the engineering department, and in 1910 he was appointed assistant to the chief engineer. In 1912 he was appointed general manager of the Moore Timber Company, Panama City, Fla., a Lackawanna property and in 1914 returned to the parent company again to become assistant to the chief engineer in charge of valuation and other matters. In 1917 he was appointed division engineer at Hoboken, the position he was holding at the time of his recent promotion.

Mr. Sherwin was born in May, 1880, at Osage, Iowa, and received his higher education at South Dakota State College, from which he was graduated in 1904. Mr. Sherwin entered railway service with the Lackawanna in March, 1905, as an assistant engineer, with headquarters at Scranton, Pa., and in 1913 he was appointed general manager of the Moore Timber Company, a Lackawanna property, with headquarters at Panama City, Fla. In 1920 he left the Lackawanna to engage in the coal and lumber business at Tampa, Fla., but in 1929 he returned to the Lackawanna as an assistant engineer, with headquarters at Hoboken, N. J.

C. P. Richardson, engineer of track elevation of the Chicago, Rock Island & Pacific, has been appointed engineer of

C. P. Richardson

water service, with headquarters as before at Chicago, succeeding **Paul M. La Bach,** who has retired. The position of engineer of track elevation has been abolished.

Mr. Richardson was born on December 27, 1882, at Concord, N. H., and graduated from Dartmouth College in 1907. He first entered railway service with the Missouri Pacific as an assistant on the engineering corps, later holding the position of assistant division engineer and investigator on special work in the office of the chief engineer at St. Louis, Mo. In August, 1912, Mr. Richardson entered the service of the Rock Island as assistant engineer on track elevation at Chicago, where he was appointed engineer of water service in November, 1918. In the following year Mr. Richardson was assigned to the chief engineer's office as assistant engineer on special assignment, and in February, 1920, he was advanced to division engineer of the Chicago Terminal division. In September, 1921, he was appointed engineer of track elevation.

Track

R. C. Dunlay, roadmaster on the Missouri Kansas-Texas at Parsons, Kan., has been transferred to Nevada, Mo., to replace **J. A. Spurlock,** who has been transferred to Boonville, Mo., where he succeeds **W. W. Marshall,** who has been appointed district engineer at Parsons, Kan., as noted elsewhere in these columns.

D. Bogue, a track inspector on the Chicago, Rock Island & Pacific and formerly a roadmaster on this road, has been appointed roadmaster at El Reno, Okla., succeeding **M. B. McAdams,** who has been assigned to other duties. **C. H. Gaylord,** formerly an assistant engineer on the Rock Island, has been appointed roadmaster with headquarters at Manley, Iowa, to take over the duties of **G. Tjaden,** who has retired.

J. J. Morissey, bridge and building master and roadmaster of the Grand River and Lake Erie & Northern (subsidiaries of the Canadian Pacific) with headquarters at Preston, Ont., has been appointed roadmaster on the London division of the Canadian Pacific, with headquarters at Woodstock, Ont., succeeding J. A. MacKenzie, who has been transferred to Guelph, Ont., relieving **L. P. Linton,** who has been assigned to other duties. **F. H. Midgley,** engineer on the Grand River and Lake Erie & Northern, with headquarters at Preston, has been appointed also bridge and building master and roadmaster to succeed Mr. Morissey.

H. B. Lincoln, supervisor of track on Subdivision 20 of the River Division of the New York Central, with headquarters at Weehawken, N. J., has been appointed general track inspector, with headquarters at New York, succeeding **C. H. Morse,** whose promotion to assistant engineer is noted elsewhere in these columns. **F. G. Smith,** supervisor on Subdivision 21 of the River division, with headquarters at Kingston, N. Y., succeeds Mr. Lincoln at Weehawken, and **L. Phelps,** supervisor on Subdivision 34 of the River divison, with headquarters at Kingston, has been transferred to Subdivision 21, to succeed Mr. Smith. **W. L. Fales,** assistant supervisor on Subdivision 34, River division, at Kingston, and formerly roadmaster on the Ulster & Delaware Railroad, now Subdivision 34, New York Central, has been appointed supervisor of Subdivision 34, at Kingston to succeed Mr. Phelps. Mr. Fales has been succeeded by **E. Smith,** formerly track foreman at Tompkins Cove, N. Y.

J. A. Schwab, in the office of the chief engineer of the Pennsylvania at Philadelphia, Pa., has been appointed supervisor on the Maryland division, with headquarters at Wilmington, Del., to succeed **H. O. Gray,** acting supervisor, who has been appointed supervisor on the Delmarva division, with headquarters at Clayton, Del. Mr. Gray succeeds **C. E. Backus,** acting supervisor, who has been appointed assistant supervisor on the Maryland division, with headquarters at Wilmington, Del., where he succeeds **M. S. Smith,** acting assistant supervisor, who has been appointed assistant supervisor on the Maryland division, with headquarters at Perryville, Md. **P. E. Feucht,** recently assigned to duty with the supervisor of motor service, has been returned to his former position as supervisor on the Middle division, with headquarters at Tyrone, Pa., and **J. D. Morris,** recently appointed supervisor on the Middle division has returned to his former position as supervisor on the Williamsport division, with headquarters at Lock Haven, Pa. **G. M. Hain,** recently appointed supervisor on the Williams-

port division, with headquarters at Lock Haven has been appointed assistant supervisor on the Philadelphia division, with headquarters at Downington, Pa.

Bridge and Building

J. R. Morphew, supervisor of bridges and buildings on the Iowa division of the Illinois Central, with headquarters at Waterloo, Iowa, has had his territory extended to include that of **H. Callahan,** also supervisor of bridges and buildings at Waterloo, who has been assigned to other duties.

Frederick McKay, bridge and building master on the Capreol division of the Canadian National, with headquarters at Capreol, Ont., has been transferred to the Allandale division with headquarters at Allandale, Ont., to succeed **J. T. Crosbie,** deceased. **W. J. Coughlin,** bridge and building master on the Hornepayne division, with headquarters at Capreol, has had his jurisdiction extended to include the Capreol division.

Obituary

W. J. McAdams, master carpenter of the Missouri division of the Chicago, Rock Island & Pacific, with headquarters at Trenton, Mo., died on March 3.

Samuel A. Seely, division engineer on the Pennsylvania division of the New York Central, at Jersey Shore, Pa., died on February 26, in the Mercy Hospital at Oshkosh, Wis., where he had gone for special treatment.

Sir Henry W. Thornton, who resigned in 1932 as president and chairman of the Canadian National, and whose railway career began in the engineering department of the Pennsylvania, died on March 14 at New York of pneumonia which set in following an operation.

E. W. Sloan, supervisor of track on the Louisville & Nashville, with headquarters at Clarksville, Tenn., died at that place on February 1, at the age of 64 years. Mr. Sloan entered the service of the L. & N. on August 1, 1892, as a track laborer, being advanced to apprentice foreman on April 1, 1893. A year later he was further promoted to track foreman and on December 1, 1910, he was appointed supervisor of track, which position he continued to hold until his death.

Columbus H. Mitchell, chief lumber inspector of the Louisville & Nashville, with headquarters at Louisville, Ky., died on February 18. Mr. Mitchell was born at London, Ky., on October 6, 1875, and entered railway service with the L. & N. in June, 1893, as a stone mason. Subsequently he served as a bridge carpenter, a track laborer, a track foreman, an extra gang foreman and assistant supervisor of track, being advanced to supervisor of track on March 1, 1913. On March 1, 1917, he was promoted to general crosstie agent and on September 1, 1918, he was appointed chief lumber inspector, which position he held continuously until his death.

Supply Trade News

General

The **P. & M. Company** has moved its New York City office from 225 Broadway to 165 Broadway.

The Waugh Paint Company, St. Louis, Mo., has been organized by **W. D. Waugh,** formerly division manager of the **Detroit Graphite Company,** in that city.

Personal

William A. Rossell, assistant northeastern district manager of the Westinghouse Electric & Manufacturing Company, at New York, died suddenly on March 8 at his home in Summit, N. J.

Arthur E. Blackwood, president of the **Sullivan Machinery Company,** Chicago, has been elected chairman of the board and will be succeeded by **Henry S. Beal,** formerly general manager of the Jones & Lamson Machine Company.

Howard P. Cook, who has been elected president and treasurer of the **Columbia Nut & Bolt Co., Inc.,** Bridgeport, Conn., has been identified with the sales department of that company for the past 20 years, serving as its vice-president since 1922. Mr. Cook is also president of the Howard P. Cook Company, Bridgeport and Chicago, dealers in railroad supplies since 1924, and vice-president of the Atlantic Manufacturing Company, Milford, Conn., manufacturers of screw machine products.

Howard P. Cook

C. Marshall Taylor, vice-president and general manager of the Curtin-Howe Corporation, New York, has been appointed manager of the New Products division of the **G. M. Basford Company,** New York advertising agency. Mr. Taylor was born on February 8, 1884, at Edgemont, Pa., and was educated at Swarthmore College. He began his business career in 1905, as a chemist with the Charles E. Hires Company and in 1906 he went with the International Creosoting & Construction Company at Galveston, Tex. Four years later Mr. Taylor entered the service of the Reading Company as superintendent of the Port Reading (N. J.) creosoting plant. In 1926 he went with the Sharples Solvents Corporation, Charlestown, W. Va., as general manager, leaving this company a year later to become vice-president and general manager of the Curtin-Howe Corporation.

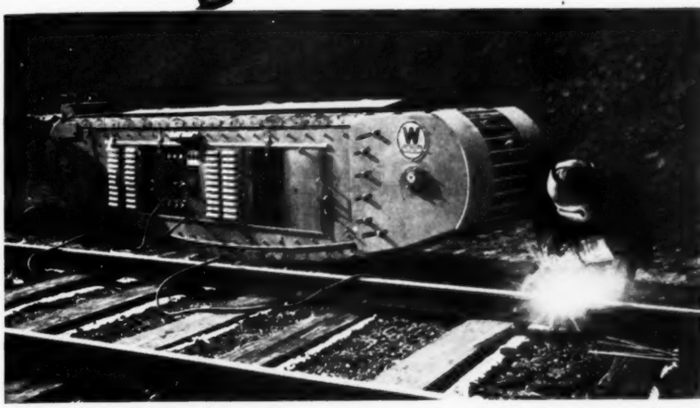
C. Marshall Taylor

George A. Nicol, Jr., vice-president in charge of transportation and government sales for the **Johns-Manville Sales Corporation,** New York, has been appointed an executive vice-president. In addition to his responsibilities on transportation and government sales, Mr. Nicol will assume direction of the company's automotive sales, including the equipment, replacement and private-brand sections and direction of sales of filtration and filler materials. **John H. Trent** has been appointed sales manager of transportation and government sales.

George A. Nicol, Jr., was born at Providence, R. I., and after attending Mount Pleasant Academy, English High School and Rhode Island School of Design, served a special apprenticeship at the Rhode Island Locomotive Works. Subsequently he was a locomotive designer with the American Locomotive Company until March, 1904, when he went to the Louisville & Nashville as locomotive designer, and later specialized in car design. From August, 1905, to 1909, he was with the Baltimore & Ohio as designing engineer in its mechanical department at Baltimore, Md. He then entered the service of the H. W. Johns-Manville Company, which later became the Johns-Manville Corporation, as railroad representative. Two years later he was transferred to the executive headquarters at New York as eastern assistant manager of its railroad department. In 1920 he was promoted to eastern manager of that department and in 1924 was appointed general manager of the railroad and government departments, as well as a director of the company. Mr. Nicol has served since 1928 as a vice-president, and now becomes an executive vice-president of the Johns-Manville Sales Corporation.

ALPHABETICAL INDEX TO ADVERTISERS

NEW! *for track maintenance*



New Westinghouse Tractor Welder for maintenance of way work. This unit furnishes power for welding and for operating electric tools such as rail grinders, nut tighteners, and drills.

TRACTOR WELDERS for the Lehigh Valley . . .

THE Lehigh Valley Railroad has developed a combined power and welding unit to reduce heavy maintenance costs charged to battered rail ends, switch tongues and manganese-insert special work.

This new equipment is mounted in a caterpillar-type tractor which is only 30 inches wide and 36 inches high permitting it to be operated along track shoulders clear of trains. It will climb slopes, cross tracks, pivot, and operate along any right-of-way. It eliminates long, expensive welding cables.

The power plant consists of a 6-cylinder gasoline engine, 300-ampere FlexArc welding generator, auxiliary generator and two propulsion motors.

Although the tractor is designed primarily for welding operations, power from its auxiliary generator can be used to operate such small tools as grinders, slotters, nut tighteners, and for lights.

Westinghouse, pioneer builder of railway apparatus for more than forty years, has built six of these new tractor welders for the Lehigh Valley Railroad. Also available for track maintenance is the recently developed Westinghouse rail car welder.

Call your Westinghouse representative for complete details about this new equipment, or simply mail the coupon.

Westinghouse

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